MILITARY REVIEW

VOLUME XXIX SEPTEMBER 1949 NUMBER 6

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CONTENTS

AMERICAN PORT OPERATIONS IN THE PERSIAN CORRIDOR	Dr. T. H. Vail Motter	3
THE LIMITATION OF 'TOTAL' WAR	Lt. Col. C. T. Schmidt, *Inf*	13
UNCOVERING JAPAN'S TECHNICAL SECRETS	Capt. W. Slocum, *USNR* (Ret.)	17
LAND DEFENSE AGAINST AIRBORNE ATTACKS	Col. P. D. Adams, *Inf*	27
SITUATION: NORMALLY ABNORMAL	Lt. Col. J. D. Cole, *CE*	34
THE ARMY GROUP G-3 SECTION	Lt. Col. M. A. Solomon, *FA*	41
THE ORGANIZATION OF LOGISTICS UNDER THE NATIONAL SECURITY ACT OF 1947	Col. I. K. Evans, *QMC*	49
PERSONNEL DISTRIBUTION—A MAJOR WARTIME PROBLEM	Lt. Col. F. J. Corbin, *Inf*	55
MILITARY NOTES AROUND THE WORLD		63
FOREIGN MILITARY DIGESTS		73
The Strategic Importance of Canada		73
Teeth for the United Nations		78
The Atomic Threat and National Defense		80
Russian Combat in Cities		85
Will the Airship Return?		92
Training Problems in Sweden		95
Air Power in a Land Offensive		97
Russian and German Tactics in World War II		100
The Germans and Air Superiority		103
An Approach to Military History		108
BOOKS FOR THE MILITARY READER		111

MILITARY REVIEW—Published monthly by the Command and General Staff College at Fort Leavenworth, Kansas, in the English, Spanish, and Portuguese languages. Entered as second-class matter August 31, 1934, at the Post Office at Fort Leavenworth, Kansas, under the Act of March 3, 1879. Subscription rates: $3.50 (U.S. currency) per year in the United States and other countries of the Western Hemisphere: $4.50 a year in all other countries. Reprints are authorized, provided credit is given the "MILITARY REVIEW," C&GSC, Fort Leavenworth, Kansas.

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American Port Operations in the Persian Corridor

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This article is a condensation of a chapter in the volume, The Persian Corridor and Aid to Russia, *one of the forthcoming books in the series,* The U.S. Army in World War II, *now being produced by the Historical Division, Department of the Army. In the full text, the author includes data on the administration, organization, special problems, and international aspects of the port operations in the Persian Gulf.* *Copyright 1949 by Orlando Ward; permission for reproduction may be obtained on request from the Chief, Historical Division, Special Staff United States Army, Department of the Army, The Pentagon, Washington 25, D.C.—The Editor.*

IN September 1942, the Combined Chiefs of Staff approved a plan of American operation of transportation facilities in the British zone of Iran designed to provide for an ever-increasing flow of shipments of war materials to the Soviet Union. The plan established three operating services within the Persian Gulf Service Command: one for the ports of Khorramshahr, Bandar Shahpur, and Cheybassi (which was in the Basra port area of Iraq); one for the Iranian State Railway (ISR); and a third, to provide supplementary inland clearance via motor trucks. Through the three ports operated by the US Army poured more than 4 million long tons of Russian-aid and other incoming cargoes.

Port operations were affected by numerous factors ranging all the way from ship discharge to administrative controls proceeding from the highest levels of strategic planning. Ship discharge was conditioned by the adequacy of ships' gear as well as of cranes, fork lifts, and similar equipment at dockside. Adequacy of berthing space and labor supply also influenced performance. The handling of landed cargoes determined in its way the rate of discharge, for inadequate dock, warehouse, and open storage space, and insufficient intraport transport, such as railway, trucks, barges, lighters, and tugs, caused the piling up of goods and diminished the capacity to unload shipping. These factors, in turn, affected the rate of inland clearance via rail and highway, as they were equally affected by the efficiency of inland clearance. Administrative controls, likewise, by determining the flow of shipping to the ports, the berthing of ships, and the allocation of movements and priorities (British, American, and Soviet), bore down heavily upon the ports.

Three ports, operated by the US Army in the Persian Corridor to speed the flow of war materials to Russia, handled more than 4 million tons of supplies before the complex task was completed at the end of 1945

Arrival of US Troops

The first American port troops reached Khorramshahr on 11 and 12 December 1942. There followed an interim period during which the gradually increasing American forces took over operations from the British. In January 1943, 16 out of 28 ships lay idle at the head of the Persian Gulf for lack of accommodation at the ports, their 165,000 long tons of cargo undischarged and no prospect of relief in sight.

By the first of May, when American operational responsibility was fully established along with effective direction of movements control, a construction program begun by the British in 1941 and continued in 1942 by the Americans had provided at Khorramshahr's Sentab Jetty seven berths connected with the shore by six trestle approaches for railway tracks and trucks. It stretched 3,251 feet parallel to the shore, and was flood-lighted for night operations. Three other dockage installations, two small lighterage wharves, a 32-acre storage area called the Russian Dump, a rail branch line from Khorramshahr inland to Ahwaz, 80 miles away, and highway connections inland, were all newly constructed to handle the increasing flow of incoming cargoes.

By midsummer 1943, British construction at Bandar Shahpur had increased the jetty, which extended 900 feet into the shallow water, to five berths, connected by trestle to the main line of the Iranian State Railway north to Ahwaz and on to Tehran. There was no inland clearance by highway from Bandar Shahpur. At both ports named, the working force consisted of US Army troops and native laborers.

Washington had allocated 100,000 long tons monthly for shipment to the Persian Gulf ports under the September 1942 plan. In November 1942, daily average ship discharge at Khorramshahr, 2 months before American port troops went into action, was only 958 long tons. In February 1943, during the interim period of joint Anglo-American operation, the figure rose to 2,234 long tons. The most pressing objective, therefore, of the Ports organization was to get ships unloaded and returned to sea.

Port Congestion

During the period from the end of October 1942, months before the arrival of the American port troops, to 22 January 1943, "average turnaround time," according to War Shipping Administration (WSA) calculations, was 55 days. In the first 5 months of 1943, the period of greatest ship congestion at Persian Gulf ports, including the American-operated ports, the WSA noted the following:

59	vessels	in	the	area	remained	40	days	or	more
46	"	"	"	"	"	50	"	"	"
33	"	"	"	"	"	60	"	"	"
22	"	"	"	"	"	70	"	"	"
9	"	"	"	"	"	80	"	"	"
5	"	"	"	"	"	90	"	"	"

Of the last group of vessels, one horrible example remained 124 days in port "before getting rid of her load." But it is noted that she was "held up on priorities and for other reasons." The note is a reminder that port operation was not simply a matter of removing cargo from ships' holds. High turnaround time was not necessarily a reflection upon the stevedores, though of course speedy turnaround was impossible if operations were inefficient. Not only could turnaround figures produce a possibly misleading impression when scrutinized at a distance of 10 thousand miles from Khorramshahr and Bandar Shahpur. Failure of discharge totals to come up to target estimates could also mislead if the estimates were not accurate. In time, the mechanisms for producing accurate estimates improved, and the passing of the target in July 1943 marked not only this improvement but improvement in techniques of port operation as well. A WSA report shows that ship turnaround time fell

steadily from an average of 51 days for April 1943 to 18 in December, and dropped during 1944 to 8.2 in September.

Rates of Discharge

Improvement in the rate of discharge was a formidable factor in bringing operations in October 1943 to a current basis; but in that month some berths were vacant for several days because of a temporary diminution in shipping. This allowed clearance of all cargo from the Russian Dump. More ships arrived in November and December, and in the latter month Khorramshahr discharged over 155,000 long tons. On 21 December, the American port troops at Khorramshahr unloaded 7,041 long tons from seven ships. Two days later, the British Ministry of War Transport sent congratulations and dispatched men to study the methods used. The record was exceeded on 13 February 1944 when 7,693 long tons were likewise discharged from seven ships at Khorramshahr. On 8 March, 2,458 long tons were unloaded from a single ship in 24 hours at Khorramshahr, and on 15 May Bandar Shahpur set a record not to be surpassed by discharging 4,475 long tons from a single ship in 24 hours.

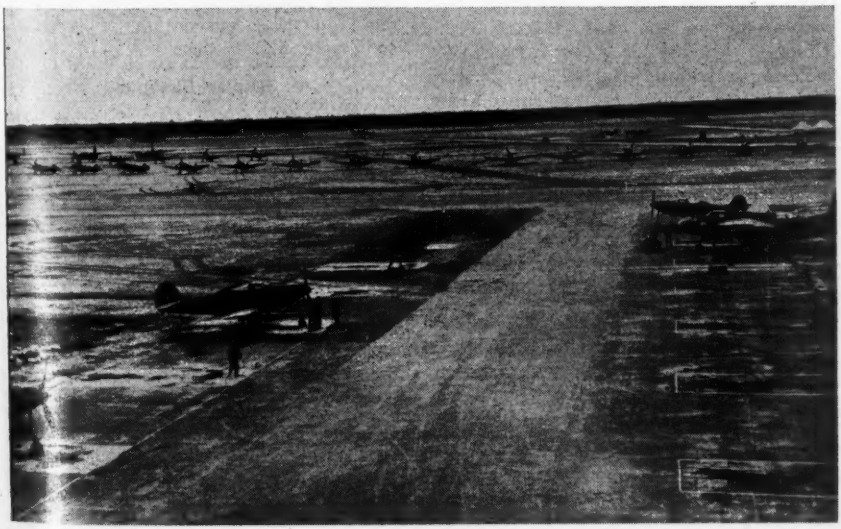
It should be realized that these figures, while correct as absolute measurements of achievement on a given ship at a given time, are no more indicative of relative efficiency than are the more abstract figures of average turnaround time or average tons per ship day. Because of the differences in ships, cargoes, and other variable factors, neither absolute daily discharge tonnages per ship nor abstract averages are reliable indices of efficiency as they are not based upon comparable factors. The number as well as the competence of labor gangs, the weather, and the nature of cargoes are too diverse to combine into comparable averages. This is true in spite of the fact that operating officers found such averages, though abstract, to be useful day-to-day guides in estimating performance.

For instance, the ship from which the record cargo was discharged at Bandar Shahpur carried a cargo of sugar in bags and possessed eight hatches instead of the usual five of Liberty ships. An unusual concentration of ships' gear, deck cranes, locomotive cranes on the dock, and the availability of an abnormally large working force all contributed to the record performance. An equally large labor party, using equal quantities of

equipment in exactly similar weather, might, while working with equal skill and diligence, take twice as long to unload a ship whose cargo was diversified and cumbersome. Records should therefore be analyzed in the light of the considerations stated. Under the far-from-standard conditions in effect at the Persian Gulf ports, no statistically reliable means of recording comparable discharge tonnages existed. Total tonnages, as shown in the accompanying charts, remain the best index of performance and efficiency.

Khorramshahr was one of the three US ports in the Persian Gulf Command through which passed vast quantities of American aid to Russia. Above, ships unloading at the Khorramshahr docks, February 1943. Below, other installations at Khorramshahr, 1944; the Russian Dump is at the upper center; upper right, a truck assembly plant.—US Army photos.

Above, a train load of American-aid tanks moving through the hills of Iran for delivery to the Russian forces, July 1944. Below, American-made planes lined up on the Abadan airfield in Iran, awaiting delivery to Russia in March 1945; the plane parts were assembled on the field.—US Army photos.



During the first 6 months of 1944, available shipping fluctuated and monthly discharge totals failed to reach the level attained in December 1943. While totals fell off somewhat, the abstract "tons per ship day" figures increased. Subject to the reservations in the foregoing analysis, the rising "tons per ship day" figures indicated that, in general, increased efficiency had less cargo to work on. During this period, the Chief of Transportation, Army Service Forces, officially recognized increased efficiency in a letter stating that, among US Army overseas ports, Khorramshahr had placed second for discharge improvement, fifth for gross discharge, and tenth in turnaround.

In July 1944, with 2,956 port troops on the job, Khorramshahr attained its peak performance by discharging 192,761 long tons of cargo, a comfortable improvement over the 41,421 long tons of the first month of American port operation there in January 1943. Sentab's seven berths and four anchorages were used almost to capacity, two berths being empty for a day. The port handled 34 ships that month—30 carrying cargo for the Soviet Union, 3 carrying US Army cargo, and 1 carrying both kinds. During July, 28 ships completed their discharge and sailed away. The installation for lighterage of heavy cargoes at Failiyah Creek took care of 70,069 long tons in July 1944 in contrast to 35,000 in April 1943 and its estimated capacity of only 9,000 in January 1943.

After July 1944, Khorramshahr operated below its capacity. In August, when the discharge total dropped to 124,000 long tons, there were 57 empty berth days and a general relaxation of pressure. The coming into use of the shorter Russian supply route through the Dardanelles was reflected in the gradual decline of the Persian Gulf route.

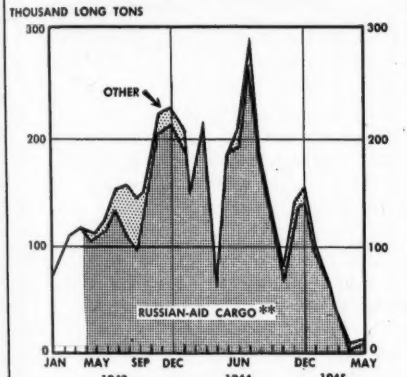
American operations at the Customs Jetty and at Khumba Wharf, both at Khorramshahr, were discontinued in August, and thereafter Sentab Jetty's berths were often vacant. By March 1945, the primary functions of Failiyah Creek were the receipt and clearance of alkylate and cumene in drums for forwarding by rail to the USSR. In early March, the remaining Soviet-bound cargo at the Russian Dump, including sheet steel, pipe, rails, oleomargarine, canned meat, and galvanized wire, was dispatched by rail and Soviet trucks. By the middle of the month, the Dump was terminated as an active installation.

In March 1945, discharge at Khorramshahr had dropped to 30,216 long tons. In effect, the port had completed its Russian-aid mission, and turned its efforts to outgoing cargoes amounting that month to about half of the incoming total. In May, the same proportions held good for Sentab Jetty, while Failiyah Creek was busy barging outgoing American locomotives. It was returned to the British on 24 June. The mission of Khorramshahr as a Russian-aid port was formally declared terminated as of 1 June 1945. During the months that followed, the port's main job was evacuation of American equipment and troops.

Bandar Shahpur

After hitting its stride in the latter half of 1943, Bandar Shahpur's developed capacity was consistently underused. Strengthened by new construction, extensive use of lighterage, the sweat and grunts of port troops and native laborers, and mounting efficiency in the loading and dispatching of rail cars, the port was able to handle more tonnage than came to it in ships' bottoms. With discharge in December 1943 in excess of 71,000 long tons, the military strength at the port was 1,676. But ships consigned to the port diminished in numbers until in April 1944 only 25 out of a possible 150 berthing days were used, and no ships were docked between the eighth and twenty-first days

CARGO DISCHARGED AT AMERICAN-OPERATED PORTS IN THE PERSIAN GULF, JANUARY 1943-MAY 1945.*



*REPRESENTS DISCHARGE OPERATIONS AT KHORRAMSHAHR AND BANDAR SHAHPUR, IRAN; DOES NOT INCLUDE REHANDLED TONNAGE LANDED AT CHEYBASSI, IRAQ.

**SEPARATE DATA NOT AVAILABLE PRIOR TO APRIL 1943.

CHART 1

DISCHARGE AND INLAND CLEARANCE OPERATIONS AT KHORRAMSHAHR, IRAN, AUGUST 1942-MAY 1945.

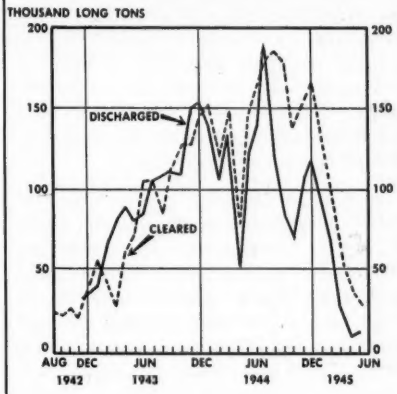


CHART 2

DISCHARGE AND INLAND CLEARANCE OPERATIONS AT BANDAR SHAHPUR, IRAN, AUGUST 1942-JANUARY 1945.

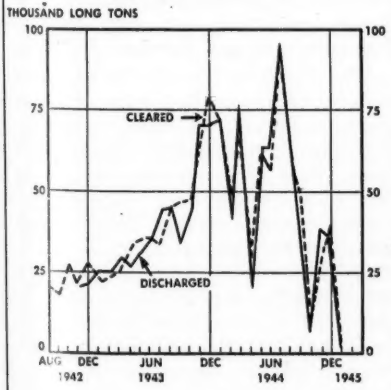


CHART 3

RUSSIAN-AID CARGO LANDED AT CHEYBASSI, IRAQ, JULY 1943-SEPTEMBER 1944.

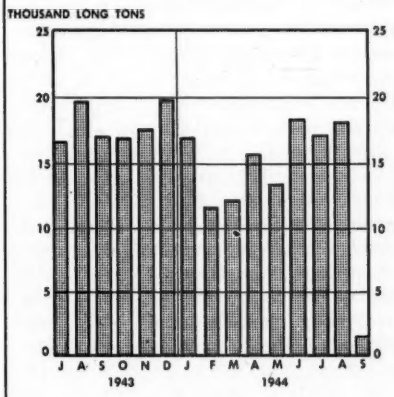


CHART 4

of that month. The Command, finding itself in the position of a restaurant keeper who does not know how much patronage to plan for, reduced the military strength of the port to 1,247 in July. But shipping rose and discharge reached its peak of 95,156 long tons in spite of the reduced military manpower. By the following November, with 1,508 port troops, discharge had fallen to about one-third of the proved capacity.

December 1944 was the last month of Russian-aid operations at Bandar Shahpur, and the next month the Americans discharged 1,199 long tons of British cargo before they climbed aboard boxcars for Ahwaz and Khorramshahr and new assignments. By the end of January, the process of handing over to the British was virtually completed. A handful of American soldiers stayed on at Bandar Shahpur most of the year performing guard and caretaking duties.

Port at Cheybassi

At Khorramshahr, the Shatt al Arab River turns and for some 20 miles runs westward to Basra. Eight miles west of Khorramshahr, the international boundary separates Iran from Iraq. By the terms of the Anglo-Iraqi arrangements of early 1941, the relatively well-equipped little Iraqi port was controlled by the British. It was the sea entrance to the British line of communication which extended to Baghdad, and, like Baghdad, with its Habbaniya military airport, Basra had its Shu'aiba military airport, both of them manned and controlled by the British under their treaty rights. Basra was, operationally speaking, British. It was essential to the supply of the British Tenth Army, and the gateway to the sea for the whole of the British Persia and Iraq Force. Russian-aid activity at the port was therefore additional to the essential business of supplying the British Army.

In the midst of this British area, the September 1942 plan proposed to assign to the American Command responsibility for the operation of a lighterage basin known as Cheybassi. Cheybassi was not even a native village, though there were a few huts there in the palm grove along the river. In fact, as a port it was not even known as Cheybassi until the local name was officially adopted to distinguish the American operations there from the British depot activities about 2 miles downstream at Tanuma, whose name had been used for the whole region on the north (or east) side of the Shatt. But although planned for American operation, Cheybassi remained in British hands until 1 July 1943, landing lightered British military stores intended for the Tanuma Depot and an occasional consignment for the USSR. In all of 1942, no Russian-aid tonnage passed through Cheybassi.

By early June 1943, it was apparent that the American Ports Service, having settled down to its tasks at Khorramshahr and Bandar Shahpur, was ready to take over Cheybassi. This was done on 1 July and Cheybassi was designated a United States port with the same status as Khorramshahr and Bandar Shahpur.

The facilities at Cheybassi, though modest, were more than adequate to take care of the traffic. There was the basin itself, jutting into the north bank of the Shatt, flanked by wharves. There was a concrete runway into the water for use by amphibious vehicles and raised concrete platforms for loading direct to rail cars. There were two 3-ton portal cranes and a 50-ton floating crane. Cargo came from ships in the stream or lying at the docks at Basra's port of Margil across the river from Cheybassi. Access was provided by rail and road.

A meter-gauge rail line connected Cheybassi and Margil over a remarkable vehicular bridge whose center span sank into the river instead of rising to make

way for ships. At Cheybassi's transfer yard, this meter-gauge line met a standard-gauge, single-track spur of the ISR which the British had constructed in 1942, connecting Cheybassi to the Khorramshahr-Ahwaz line. This spur, like the ISR south of Tehran, was American operated. Access roads connected Cheybassi with Tanuma and Khorramshahr on its side of the Shatt, and with the Basra dock and business areas of Margil and Ashar on the opposite bank. In August, the Cheybassi operating troops occupied new barracks built a mile and a half inland on the desert to avoid the mosquitoes which plagued the river bank.

From the start, operations at Cheybassi differed from those at the other American ports. For one thing, there was much less variety in cargoes handled, Cheybassi's function being primarily to handle heavy cargoes like tanks which could not be trucked from the Basra area over the British highway route to Tabriz, and which were therefore lightered to Cheybassi and put directly aboard ISR flatcars for the journey to Tehran. For a time, petroleum products and alkylate in bulk tins and drums from the Abadan refinery were lightered to Cheybassi for transhipment to the USSR. In addition, there was at all times an agreed American obligation to provide unloading at Cheybassi on 24 hours' notice for British military stores up to 200 long tons per day. Though the total never exceeded 2,500 long tons in a given month, the proportion of British stores to USSR cargoes handled varied. Russian-aid cargoes ranged through the period of American operation at Cheybassi from 50 percent to 90 percent of the total at a given time.

In a second respect, Cheybassi differed from Khorramshahr and Bandar Shahpur, for Cheybassi was, as it were, an American enclave in British country. Even its tonnages derived from British tonnages, for nearly every ton that was landed at Cheybassi by the Americans had already been discharged elsewhere under British operation. Relations were bound to be close, and cooperation was cordial and efficient. By the Anglo-American agreement of June 1943, the American Port Commander operated the Cheybassi lighterage basin, adjacent docks and open storage areas, camp, and ISR railway spur.

In return, the British retained control over movements and security, maintained the wharves, and operated light and power services, while their Inland Water Transport (IWT) supplied lighters and tugboats along with a daily statement to the American Commander as to lighter cargoes destined for his port. There is no record of difficulties arising over allocation of lighters such as occurred at the Iranian ports. It is a fair assumption that these things were more smoothly managed, not only because the American and British forces were actually engaged at Cheybassi in joint work, but because the American staff there was in direct and personal touch with the IWT.

In one respect, Cheybassi was similar to the other American ports, for all three developed more capacity than was used. Cheybassi, though, had not the comfort of reaching, if only once or twice, its full potentiality. The 1942 plan had estimated a monthly tonnage of 30,000 for the port. In August 1943, 19,731 long tons were landed, being followed in December by a performance of 19,840 long tons. In the following 8 months, landings ranged between 12,000 and 19,000 long tons; but the December figure was the peak, far below estimates. As in the cases of the other ports, the organization was ready, but the business went elsewhere, as the European war receded westward.

Because Margil, the port of Basra, had been eliminated by Allied planning as a Russian-aid port, and because the petroleum and alkylate shipments from Abadan had been diverted to Failiyah Creek, it was decided that Cheybassi was no longer required. With landings at the vanishing

point in September, the port in effect returned to British control. Official transfer took place on 5 October. In 15 months of American operation, total landings were 235,000 long tons.

British Ports

Four ports in the Persian Gulf area, although operated by the British, received Russian-aid cargo in which the American Command had a direct interest. Bushire, the ancient seaport of Iran some 200 miles down the east coast of the Gulf beyond Khorramshahr, had been marked in the 1942 plan for American operation, but was eliminated early in 1943. Until July, it received consignments of crated motor vehicles from the United States which were assembled at Bushire for delivery overland to the USSR. After July, no Russian-aid cargoes passed through Bushire.

Because of its possession of suitable dock facilities, the wharves on the island of Abadan in the Karun River just below Khorramshahr landed a substantial portion of the crated aircraft shipped from the United States for assembly at Abadan and delivery to the USSR. Most of these aircraft were discharged first at Khorramshahr and barged to the British-operated docks at Abadan.

At Ahwaz, about 80 miles up the Karun River, the British operated a barge terminal at which, at the beginning, minor quantities of US Army cargo and some Russian-aid cargo were landed from barges. The experiment of hauling US Army cargoes by barge from Khorramshahr to Ahwaz was stopped by the end of April 1943. Because the American mission was primarily to speed the flow of supplies to the Soviet Union, and because only 10 percent of the Ahwaz tonnage was destined for the USSR, Ports Service recommended that the American Command should not take over Ahwaz operations from the British. Soon afterward, both American and Russian-aid cargoes were diverted elsewhere.

At Margil, the dock area on the Basra side of the Shatt al Arab River opposite Cheybassi (Basra is some 2 miles inland), Russian-aid cargoes arrived in considerable quantities during 1943 and 1944, and American port officers were therefore stationed at Basra to coordinate movements with the British. Between June 1943 and November 1944, these cargoes totaled 446,430 long tons. The lion's share of the total was discharged at Margil and trucked overland to Tabriz via the British-operated barge-truck-rail route known as the Khanaqin Lift. The balance was carried across the Shatt by lighter to Cheybassi and thence by the American-operated ISR to Tehran. Concentration of Soviet-bound freight in the latter half of 1944 at the American ports, and abandonment of the Khanaqin trucking route, reduced Margil's Russian-aid tonnage to a trickle in September 1944, and to nothing at all after November.

Inactivation

Ports Service was inactivated in October 1945 as a separate operating service of the Persian Gulf Command, and its remaining functions, chiefly those having to do with the evacuation of remaining American troops and equipment, were taken over by Command headquarters. Already, the supplementary docks and lighterage wharves at Khorramshahr had been taken over by the British, leaving only Sentab Jetty in American hands until the end. On 30 December, the Army transport *General W. P. Richardson* cleared the port of Khorramshahr, carrying the last American soldier homeward. The ports operation was the first to be begun, the last to be finished, and, throughout the entire period, the most complex to be carried on among all the varied and difficult tasks of the US Army in the Persian Corridor.

The Limitation of 'Total' War

Lieutenant Colonel Carl T. Schmidt, *Infantry*
Former Instructor, Command and General Staff College

THE two World Wars of our times are often described as "total" wars. They are contrasted with the "limited" wars of a happier past—the Franco-Prussian War, say, or the Crimean War, or the War of Jenkins' Ear. Furthermore, it is said that any war of the future will be even more "total"—if that is logically possible!—than were World Wars I and II.

But just what makes war "total"? Does the "totality" of a war refer to the area it embraces, to the scope of its mobilization, to its ultimate objectives, to its methods, or perhaps to a combination of these things? Certainly, it is not always clear just what is meant, other than that "total" war is in one or several respects "unlimited" war.

Unlimited War

Now, war may be more or less unlimited in at least four respects:

1. One is the *area of conflict.* The participants in World War II included most of the leading nations of the world, and the theaters of hostilities were worldwide. In this geographic sense, World War II was certainly far less limited than, say, the localized Russo-Japanese War of 1904-1905.

2. A second aspect relates to the scope of *mobilization.* In this respect, war is said to be unlimited when it requires the mobilization of all resources, human and material, that can contribute to the community's war-making power. This, apparently, is the original meaning of the term "total war." A corollary is that war must be made upon all the resources of the enemy that contribute to his military power. In World Wars I and II, most of the belligerents undertook a relatively comprehensive and systematic mobilization of their military-economic forces. These forces were employed to attack not only the enemy's fighting arms but also his industrial system; that is, his ability to feed, clothe, and equip himself. This was a marked contrast to the limited wars of the eighteenth century, which were fought chiefly by the small professional armies of the dynasts, and which involved only a minor part of a nation's resources.

3. Another aspect is the *ultimate aim* of a war. From this standpoint, war is held to be unlimited when its aim is the destruction of the sovereignty and the basic political and economic institutions of the enemy. The aim of each belligerent is to fight to the finish, that is, until the enemy has exhausted his capacity to resist the proposed destruction of his in-

Shallow concepts of "total" conflict have made the hard-won laws of war appear to be old-fashioned, but the advantages of limited aims and methods of warfare are too important to permit them to be ignored

stitutions. The goal is not a negotiated peace but abject surrender. Here again, the two World Wars are in sharp contrast to wars of limited aims, as, for example, the Spanish-American War or the Franco-Prussian War.

4. A fourth aspect is the *methods of warfare*. Unlimited war in this sense is war that knows no restrictions upon its methods. The principles of humanity and chivalry are cast aside. Expediency is the only rule. No distinction is made between combatants and non-combatants. Prisoners may be enslaved or butchered. Entire communities may be exterminated—incidentally or deliberately—by any means at hand. Certainly, World Wars I and II marked a steep decline in the standards of humane behavior during war. The written and unwritten "laws of war" were widely honored in the breach, rather than in the observance. These conflicts witnessed an appalling growth of brutality to prisoners, a sweeping disregard for damage done to civilian populations, wide-spread looting, and inhumane treatment of conquered peoples. Such breaches of humane considerations were not universal, to be sure, but they were on a big enough scale to be in sharp violation of standards that had come to be accepted during the preceding two centuries. The methods of warfare were increasingly governed by considerations of immediate expediency, and less and less by moral rules or even by rules of long-time self-interest.

The evidence of history shows that these four ways in which war may be unlimited are associated with one another—not invariably nor necessarily, but often enough to suggest a common cause.

A Common Cause

What is that common cause? Or, to state it in a different way, under what conditions is it relatively easy to restrict the scope and conduct of war? Fundamentally, the answer appears to be as follows: The scope and conduct of war may be restricted when the hostile powers are not bent on annihilating each other's social systems. In limited conflicts, there is no purpose on either side of destroying the hostile nation's social fabric, much less of suspending its sovereign existence.

When, however, the belligerents are engaged in a conflict between basic ideals and institutions, when the struggle is over the very existence of such things, then it is indeed hard to apply limits to the conduct of war. Such a conflict is always more ferocious than is one between parties whose differences are comparatively superficial. The worst atrocities occur when a deep gulf of culture divides the combatants or when frenzied fear or hatred interferes with the dictates of humanity or prudence. In such a situation, too, new weapons—like the submarine and the airplane—that do not appear to fit into the traditional codes of war are likely to be used without compunction. Furthermore, an abundance of human and material resources, made available by universal mobilization of manpower and machine industry, seems to have encouraged the tendency toward wars of utter abandon. Under these conditions, then, it is undoubtedly difficult to apply limits to the methods of warfare, but it is perhaps not utterly impossible and certainly not undesirable.

Limitations of War

It took a long time for the avowedly civilized world to agree with Rousseau that "war is a relation between state and state in which individuals are enemies only accidentally and may be killed only while they are bearing arms." But the world did, in time, agree. At least, it agreed to the extent of promising to obey codes governing the conduct of hostilities. Ought these hard-won limitations be

abandoned merely because they now seem harder to apply?

The belief seems to be growing that it *is* impractical to hold to rules of war; that war is either to be abolished or it is to be unlimited. As Liddell Hart points out, this idea was summed up by a former British Air Minister when he declared that "efforts to formulate rules for war, to limit its scope, to prevent its worst atrocities, to civilize it, and to bring it up to date, merely help to perpetuate an international crime." In effect, why seek to maintain and extend the rules of war in an age when war can know no bounds? Why hold to a fiction of the "law" of war?

It is just here that a loose and possibly reckless application of the concept of "total" war may lead to a false and dangerous conclusion. To say that modern war is "total" all too often is only an expression of indifference to even the most excessive brutalities. It becomes a way of saying that war is no longer *conceivable* as limited in any aspect. A further implication is that the sooner and the more completely a belligerent throws off restraints on its war aims and its methods of warfare, the more likely it is to be victorious.

But must we surrender to the dismal conclusion that, unless war is abolished, we must be reconciled to war of unlimited aims and methods? Does it really follow that it is nonsense to seek limitations?

The Object of War

After all, the immediate, technical object of war—the "victory" that is desired—is to convince the enemy that it is not worth his while to oppose our desires. The object is not to destroy the enemy. It is to remove his will to fight. For that purpose, it may or may not be necessary to destroy the enemy's armed forces. By the same token, it may not be necessary to destroy his industrial system. Moreover, if attack upon specific industries should become a military necessity, it may not *also* be necessary to destroy the enemy's towns and cities, his unarmed people, nor his sovereignty. And even if the ultimate aim is a drastic change in the enemy's political complexion, the less incidental damage there is the better. Only madmen would seek to make destruction an end in itself.

These things seem obvious enough. Yet, we cannot remind ourselves too often that the only meaningful purpose of war is peace. War, whether "total" or "limited," is fought rationally only for the sake of a better peace.

Problems of Peace

The attainment of peace becomes vastly more difficult when the aims and methods of war are unrestricted. For one thing, the passions aroused in unlimited war tend to increase the determination of the enemy. They may add to his numbers, too, by inducing other powers to give him their support. Moreover, the victor in a war of wide devastation and flaming passions must attempt to impose the conditions of peace upon a people who at best are passive and at worst may merely be waiting for their day of revenge. Then, too, at the end of a long war of mutual destruction, the victor may be only a little less exhausted than the vanquished. Yet, in order to reap at least some fruits from his Pyrrhic victory, he may be obliged to divide his diminished material resources with an erstwhile enemy. The greater the devastation, material and spiritual, the more difficult is the reconstruction of an ordered community and the more likely is further social and international conflict.

We should remember, finally, that limitless war has a demoralizing and degrading effect upon the people who practice it. It puts a premium on standards of conduct that are inconsistent with sane behavior in an ordered civilization. If a nation fights in the name of more humane

treatment of man by man, it cannot afford to ignore the humane conventions in its conduct of war. Otherwise, its own people may lose what they are attempting to defend. An essential part of the Western World's civilization is an attachment to the ideal of personal, individual liberty. This ideal finds expression not only by insisting on the worth and dignity of the individual human being, but also in a repugnance to the infliction of needless human suffering. Already, unlimited war has gone far toward undermining the moral and material foundations of the Western World.

Self-Interest

To paraphrase Sherman, war—war of any kind—is hell. Yet there is no need to make it even more hellish because a shallow concept of "total" war has made the hard-won laws of warfare seem old-fashioned. If a better reason than humanitarian sentiment be sought for limiting the aim and methods of war, it can be found in a long-run self-interest. Such self-interest may be found in the kind of peace we desire, in the employment of our manpower and weapons on missions that contribute more to victory than does blind mass destruction, or in so simple a consideration as taking care of prisoners because we need the information and the labor they can give us. In the heat of conflict, it is not easy to pay heed to arguments for limiting warfare. But the wise statesman and the wise strategist will pay them heed.

In essence, the argument comes to this: A ruthless enemy and a war for survival may *in practice* make impossible any restraint in the use of military measures. We must be prepared for that. But the advantages of restraint are too great to warrant prior abandonment of the *principle* of limited aims and methods of war.

Despite all the amazing progress in scientific research and development—yes, in spite of the atomic bomb itself—any conceivable future war will find ground forces locked in combat; it will find navies plying the seas; and it will find airplanes of all types and on all sorts of missions being piloted and maintained by human beings.

Secretary of the Army Gordon Gray

Sept 1949

New weapons have made the risk of war a suicidal hazard. Any nation which does not exert its vigor, wealth, and armed strength in the avoidance of conflict before it strikes shall endanger its survival. It is no longer possible to shield ourselves with arms alone against the ordeal of attack. For modern war visits destruction on the victor and the vanquished alike. Our only complete assurance of surviving World War III is to halt it before it starts.

General Omar N. Bradley

UNCOVERING JAPAN'S TECHNICAL SECRETS

Captain Winthrop Slocum, *US Navy Reserve (Ret.)*

IT may surprise some readers to learn that the United States Navy sent a group of missionaries to Japan immediately after that nation admitted its fall from divine favor in the summer of 1946. These persons, however, were not of the Chaplain Corps dispatched to propagate religion in Nippon. They were a group of officers and civilian engineers and experts, members of the US Naval Technical Mission to Japan. Our Navy wanted to determine the position of the Japanese in the field of naval technology. The fighting war had been won—what scientific lessons could we learn from our erstwhile enemy?

How did the design and construction of the Japanese warships compare with ours? What range and power had their guns? How heavy was their armor and what was its metallurgy? Were they ahead of us in electronics development? The Navy wanted the answers to these and a thousand other technical questions.

To obtain the desired information, it was essential that investigators enter Japan with the Occupation Forces, before manufacturing plants, equipment, materials, and records could be destroyed and experienced personnel dispersed.

Mission Established

The US Naval Technical Mission to Japan, better known as NavTechJap, was established on 14 August 1945 by an order of the Commander in Chief and Chief of Naval Operations. The purpose of the mission was to survey all Japanese scientific and technological developments of interest to the Navy and Marine Corps in the Japanese Islands of Hokkaido, Honshu, Shikoku, and Kyushu; in China; and in Korea south of latitude 38°N. This involved the seizure of intelligence material, its examination and study, the interrogation of personnel, and, finally, the preparation of reports which would appraise the technological status of the Japanese Navy and Japanese industry.

The surrender of the Japanese in mid-August served as a jet-assisted take-off for the Naval Technical Mission which sailed from Pearl Harbor on 1 September. It was part of the convoy that entered Sasebo Naval Harbor on 23 September 1945, in the initial occupation of Kyushu. Within 3 weeks, technical intelligence teams stemming from Sasebo had entered Tokyo, Yokohama, Yokosuka, Kure, Hiroshima, Osaka, Nagasaki, Shimonoseki, and many other cities with, or shortly after, the initial landing of the Army or Marine units in those places.

Before the cessation of hostilities, the Office of Naval Intelligence had ready a

A US Naval Technical Mission which went into Japan as soon as the war ended in 1945 not only uncovered important Japanese naval secrets but also discovered many other developments of Japanese scientists

publication, "Intelligence Targets—Japan." This was a series of pamphlets stating the Navy Department's requirements for intelligence exploitation in Japan, and represented the coordinated demands of the Chief of Naval Operations, the several material Bureaus, the Office of Research and Inventions, the Naval Research Laboratory, and other technical activities. The targets contained therein emphasized naval interest entirely. Nevertheless, they had also been coordinated with the War Department Intelligence Collection Committee in those cases where War Department interests paralleled those of the Navy.

There were other intelligence units operating in the Empire, too, such as the Compton-Moreland Scientific Survey, the US Strategic Bombing Survey ("Usbus"), the Air Technical Intelligence Group ("Atig"), and the Military Intelligence Section of SCAP. The function of NavTechJap had to be correlated with the activities of these other groups in order that all intelligence units could profit from the disclosures obtained by each.

Intelligence Objectives

What sort of things were the Navy Bureaus interested in? What was the nature of some of these individual targets? First, of course, were such items of general intelligence as Japanese naval war plans, war diaries, and battle reports; budget estimates and annual construction figures; codes and ciphers; hydrographic and meteorological information; personnel figures and training programs.

The Bureau of Ships was naturally interested in the characteristics of Japanese naval vessels in service and under construction; submarines; mine detectors; electrical equipment; and ordinary things like ship's-bottom paints.

The Bureau of Ordnance wanted information about torpedoes and their aerial counterpart, guided missiles; mines and depth charges; rockets, bombs, ammunition, armor, and the big naval guns.

The Bureau of Aeronautics, of course, inquired about new designs of aircraft, new types of engines; progress in jet propulsion and in propeller research; deicing equipment; parachutes; photographic equipment.

The Bureau of Medicine and Surgery was especially interested in data relative to life in the jungle and on sea islands, particularly that apropos diet, malaria control, and insect repellents; infection of Naval personnel with tuberculosis (in view of Japan's high TB rate); neuropsychiatry and rehabilitation. A special target of considerable interest at the time involved the medical effects of atomic bombing.

Electronics targets were set up separately, in view of the importance of this equipment in modern naval warfare. Information was desired about all kinds of radar and radar countermeasures; direction finders and navigational aids; electron tubes, antennas, and many other subjects, all very technical.

Only a few of the engineering and medical members of NavTechJap could speak Japanese. To undertake investigations in a foreign country without knowledge of the language would be like trying to scale a high wall without a ladder or rope. But the Navy had foreseen this problem, and language officers were made available as interpreters. Many of them had been teachers of language in high schools and colleges before their commissioning in the naval reserve. They had been given 6 months to a year of very intensive training in Japanese. This is an extremely difficult language, and their instruction, of course, had to cover not only social conversation but technical terms used in nautical practice, in electrical engineering, chemistry, metallurgy, and so on. Fortunately, engineering drawings and blue prints speak a universal language, and

when these were available, as was often the case, the discussions proceeded under a full head of steam.

In many instances, it was necessary for the Navy technician to do considerably more than simply to investigate the material on hand. For example, a new model, 20-cylinder diesel engine was about 50 percent completed when Japan surrendered and all construction and development of war equipment stopped. The engine showed promising possibilities. The originating Japanese engineers and scientists were located and brought back to complete its construction, at the expense of the Japanese government. Upon completion, tests were run under NavTechJap supervision, to determine its performance.

NavTechJap investigators, unarmed and often alone, visited scores of places in Japan, both urban and rural, and never once were molested or threatened. Usually, the American was ignored, little curiosity being displayed by Japanese adults. When the Japanese were asked for information, friendliness and willing cooperation were the general rule.

Of considerable interest was the observation that the Japanese Army and Navy both deliberately spurned the Japanese scientist, whose knowledge, laboratories, and research equipment might have contributed so much toward a more successful prosecution of the war by the Japanese. The scientist recognized this and felt deeply injured over the lack of confidence in his ability and his loyalty. Little organized research was carried on during the war outside of the Army and Navy. A corollary to this is the fact that by such policy Japan failed, in general, to realize those tremendous and permanent scientific advances that a modern nation gains from huge wartime expenditures for research.

The common concept that the Japanese lack originality and are merely an imitative people is in need of qualification. They entered the fields of science and mechanical industry only a comparatively few years ago. The sensible thing was to engage in wholesale copying until they caught up with other countries. Had they proceeded independently in scientific research and discovery, they would always have been 50 years behind. The Japanese may be especially adept at copying, but evidence of their originality and ingenuity is not lacking.

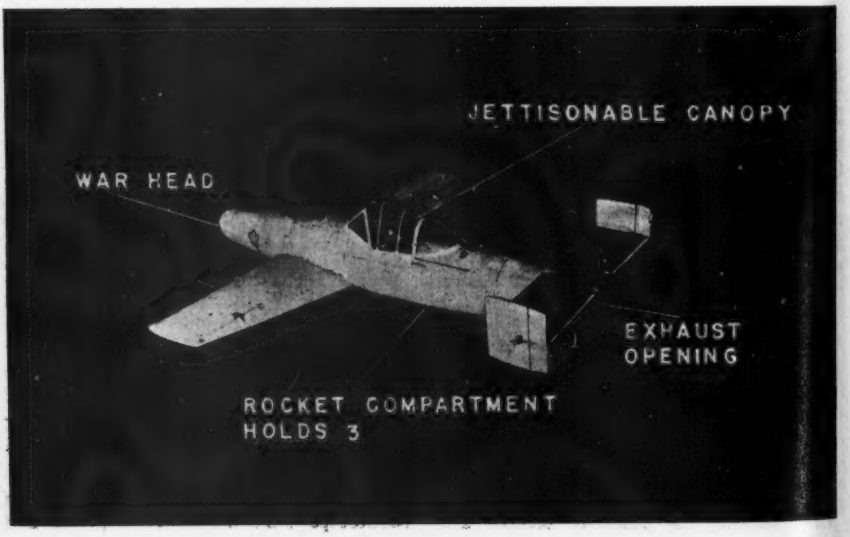
Lack of Axis Coordination

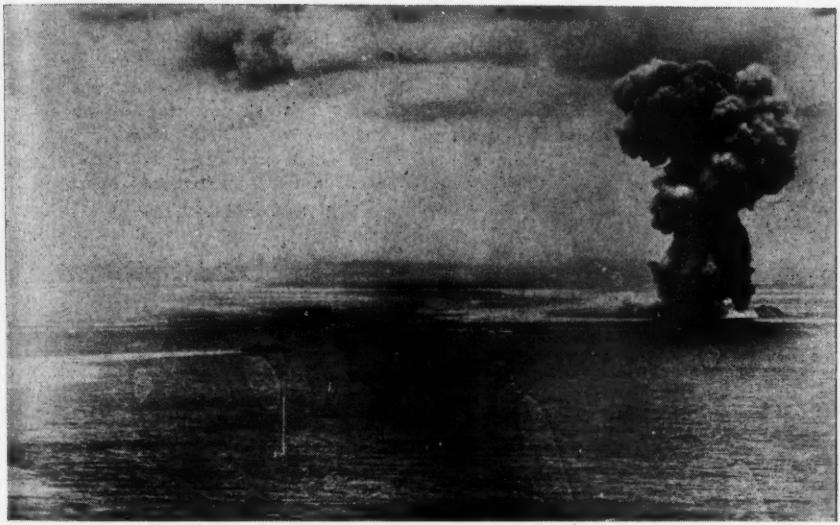
The Japanese received very little effective help from the Germans or the Italians. It is true that many Japanese submarines were equipped with the *Schnorkel*, but it is understood that the Japanese saw a German submarine in Hong Kong and copied the *Schnorkel* features. A Japanese submarine crew was sent to Germany for training, but all hands were lost on the trip back. Some assistance was received from Germany pertaining to electronics, but Japan was still well behind us in the design of this equipment. Such information as the Japanese obtained was largely of a general, rather than a specific nature. The single important exception seems to have been the assistance given by Germany in the sonar field. Some of the Japanese equipment was almost an exact copy of captured British equipment.

At the time of the Pearl Harbor attack, Japan had a strong and well-equipped navy, with ships that were of good design and rugged construction. Three of them, the battleships *Yamato* and *Musashi*, and the aircraft carrier *Shinano*, were the largest, and in many respects the most powerful, warships in the world. The *Yamato* and the *Musashi* had standard displacement of 63,000 tons each (when fully loaded, 73,000 tons) and a speed of 28 knots. Their main battery, consisting of nine 46-cm (18.1-inch) guns, had a maximum range of 45,000 yards.

To match this, the largest United States battleships were the *North Carolina* and

Many of Japan's war secrets and other important technical developments were revealed as a result of investigations by the US Naval Technical Mission to Japan. Above, the Baka Bomb, a rocket-propelled bomb which was designed as a "suicide" weapon. Below, the essential functional parts of the Baka Bomb are shown.—US Navy photos.





Shortage of fuel was Japan's "Achilles heel" toward the end of the war. Above, the mighty battleship *Yamato,* sinking after an attack by US Navy planes, was burning soya bean oil for fuel when it met disaster. Below, a view of Kure Harbor, Japan, where submarines, destroyers, and other vessels were immobilized.—US Navy photos.

Washington, of 35,000 tons standard displacement, 28 knots speed, and main battery of nine 16-inch guns.

The 18.1-inch, 45 caliber, rifles of the *Yamato* were the largest naval guns in the world. NavTechJap shipped home two similar guns they located at the Kamegakubi Proving Ground, each 75 feet long and weighing 180 tons. They were sent by LST, not by Parcel Post.

Submarines

During the latter part of the war, surface ship production was largely abandoned by the Japanese in favor of submarine production. During 1944, they brought out the I-400 class-three, huge submarines whose primary mission undoubtedly was the bombing of the Panama Canal and cities on the west coast of the United States. They had a displacement of 5,550 tons each, a length of 400 feet, a maximum speed of 19.7 knots surfaced and 7 submerged, and a cruising range of 34,000 miles at 16 knots. Eight torpedo tubes and one 5.5-inch deck gun comprised the armament. In addition, in a hangar tube (11.6 feet in diameter) on the main deck, each submarine carried three bombing planes, each weighing about 4 tons, capable of 290 knots speed, and carrying a bomb of 0.8 tons or one 18-inch airplane torpedo.

By comparison, our largest submarine was the *Nautilus*, with a displacement of 2,730 tons, a length of 371 feet, a speed of 17 knots surfaced and 8.5 submerged, and a cruising range of 15,000 miles. The armament consisted of eight tubes for 21-inch torpedoes, and two 5-inch guns which were later replaced by 3-inch.

Japanese ingenuity resulted in a great many different types of submarines for specialized purposes. The multitude of classes, each consisting of relatively few submarines, proved to be a major weakness in their submarine policy, resulting, as it did, in lack of standardization and consequent limitation of production. The entire hull and outside decks of most Jap subs were coated with a thick black substance which offered at least partial protection against detection by radar and echo-ranging. Their latest submarines used small belt-drive motors for low-speed, quiet, submerged operation, a splendid idea obtained from the Germans, incidentally. And they incorporated an American idea in the design of at least one of their models, namely, a fireman's pole for quick descent of deck personnel in case of a crash dive. Gravity being unaffected by military edict or Japanese ingenuity, it was still necessary for the submariner to climb a ladder on the up-and-out-bound journey, if any!

The Japanese developed very successfully torpedoes of three different types, using pure oxygen, air, and electricity for propulsion. There was nothing unusual about the 18-inch, air-driven torpedo, but the 21-inch electric type, with a range of 7,500 yards at 30 knots, was an effective weapon because it left no wake and was easy to manufacture. Hence, it was used extensively.

Paper Balloons

Most readers will recall the Japanese Army's effort to use paper balloons as weapons of war. Some 8,000 to 9,000 balloons were launched in 1944, each carrying a load consisting generally of a 15 kilogram high explosive bomb and 4 or 5 kilograms of incendiary bombs.

It was estimated that 10 percent of the balloons released would be carried by air currents to the American mainland and would start forest fires or cause other damage. The project was conceived principally to boost home morale and also to serve as a psychological warfare threat against the United States. It was discontinued because of negligible results, the advent of unfavorable weather, and a shortage of hydrogen gas. An investiga-

tion was undertaken by the Mission to learn if this project bore any relationship to plans for bacteriological warfare. Extensive research was known to have been carried on by the Japanese Army Bacteriological Warfare Section, but no connection could be established linking it with the trans-Pacific paper balloon project.

In time of war, persons of every nationality show unlimited courage and self-sacrifice, but never before was the willingness of the individual soldier to destroy himself so incorporated into the wartime policy of a nation. When Japan was forced to change from offensive to defensive warfare, she realized it would cost the lives of many brave men. Coolly and efficiently, however, she devised plans and equipment which would take numerous enemy lives in exchange for each native son.

The Suicide Forces

The best known of these implements of self-destruction was the *Kamikaze* plane, or dive bomber. It was considered not so much a projectile carrier as the projectile itself, with a human being as part of its steering and control mechanism. The men who volunteered for this one-way ride were a select group of Japan's best pilots, and there were always more volunteers than planes.

The *Baka* Bomb and its human control was a variation of the same idea of death in and from the air. This was a small jet plane or glider, with a pilot locked in, along with a heavy load of high explosive. It was carried under the fuselage of a larger plane which launched it a few miles from its target.

On the surface of the water, it took the form of *Shinyo*, a small special attack boat which utilized the explosive charge in its bow by ramming the side of the intended victim. These motor boats were collected in special attack basins along the coast or were carried on mother ships. Such suicide craft were manned by middle-school boys of 15 and 16 years of age. It is reported that an ample supply of volunteer pilots was obtained because of special privileges, early responsibility, fast promotion, and the promise of a posthumous monetary award to the volunteer's parents.

Underwater opportunities for destruction stimulated the Japanese imagination. The *Kaiten* ("Great Undertaking") was a one-man submarine, or more accurately, a type 93 torpedo with a human pilot and additional fuel capacity inserted between the torpedo warhead and the torpedo engine. Six *Kaiten* were carried on the decks of I-type submarines and connected by tubes through which the pilot could enter the torpedo and start on his journey without the submarine having to surface. These midget or suicide subs were manned by young volunteers of 18 to 20 years, attracted by much the same inducements offered the *Shinyo* pilots. The Japanese claimed great success in the encounters between *Kaiten* and enemy shipping.

For the Pearl Harbor attack, five submarines of the I-16 class were specially fitted to carry one two-man submarine each. All five of these *Ko Hyoteki's* were successfully launched, and all were lost. (The "I" class submarines all returned). Lieutenant Iwase, senior commander of the two-man subs, reported by radio that he had successfully attacked a battleship of the *Arizona* class, which was a very modest statement. Considering the unbelievable damage wrought in that attack, he might have claimed the sinking of Ford Island itself, without greatly exaggerating the situation.

Amphibious Tanks

The Japanese also had amphibious tanks 35 feet long that rode "piggy back" on submarines. In preparation for an attack, the submarine would surface, and, after the tank had drained, it would be boarded

by a crew of 1 officer and 6 men and a landing party of 35 men. The tank would then be driven off the sub, or the latter would submerge, leaving the water-borne tank ready to proceed under her own power. When the Nipponese strategy turned defensive in 1944, these sea-going tanks were modified to include torpedo cradles. Upon reaching an objective, both torpedoes would be released at short range. No attempt to return ashore for re-loading would have been made, as the expendable tank would have simply been scuttled on the spot, and the brave but hapless crew would join their honorable ancestors. These mechanical oddities were never known to have been used operationally, although about 100 were built.

Still another, though less well-known suicide group, was the *Fukuryu*, or "Crouching Dragons." Had the war reached the stage of repelling an amphibious landing on the shores of Honshu, the *Fukuryu* were prepared and equipped to walk underwater and ram an explosive bomb against the hull of an enemy landing craft. These "underwater kamikazes" wore diving suits equipped with two oxygen tanks, submarine-type air cleaning devices, and tubes for liquid food. They could operate effectively in water 50 feet deep; they could walk underwater more than a mile an hour, and could stay underwater for 10 hours. At the war's end, 4,000 *Fukuryu* were at the Yokosuka Naval Base, of whom 1,200 were fully trained.

Use of Ocean Currents

Loss of much of her shipping capacity and the resulting fuel and food shortage caused Japan to give consideration to suggestions by her oceanographers that ocean currents be utilized for transportation of necessities. Since 90 percent of the drift bottles set adrift in the Japanese Sea off the east coast of Korea reached the northern part of Honshu, it seemed feasible to use the *Kuroshio* (Japan Current) for the transportation to Japan proper of soya beans from Manchuria, and other goods from Formosa, Nansei Shoto, and other places. A small wooden ship of 200 tons was successfully floated from Fusan to Honshu. Then plans were made for floating metal drums which would drift below the surface; some in every lot would be equipped with radios and at intervals they would rise and be contacted by land stations in order that their movements could be traced. Loss of the Philippines, meantime, prevented carrying out the plan.

Japan was far behind us in the field of electronics, but her experiments with a "Death Ray" may have the unique outcome of saving countless lives threatened by tuberculosis. These experiments showed a pronounced effect on the lungs of the animals tested, and further research was contemplated toward a possible cure for tuberculosis. It was noticed that higher frequencies affected the brain. The investigators realized that heat was an evident factor, but they were sure that frequency was important also. The frequency characteristic could be associated with the resonance dimensions of the head and body respectively. It is quite possible that Japanese or American investigators may develop treatment for tuberculosis and for certain brain disorders that will have great therapeutic value. A mass chest X-ray program for the diagnosis of tuberculosis was interrupted by the war, but Japan was using an "immunization" technique that should be further investigated.

Night Blindness

Japanese medical officers observed that most cases of night blindness occurred with pilots having liver trouble and whose secretion of the bile was not normal. Acting on this hint, they developed a preparation named *Migozai*, whose ingredients stimulate the secretion of the bile

and the absorption of Vitamin A, so necessary for the retina of the eye. The vision of the dark-adapted eye, when taking this preparation, improved from 1½ to 2 times. This means that, looking at the same object, the eye can see it from twice the distance.

More notable, and certainly more far reaching, is the discovery of two drugs by Japanese who were searching for some therapeutic agent resembling chlorophyll, with its power of converting sunlight into energy. These were derived from neocyaine and named *Koha* and *Shiko* (meaning Rainbow Wave and Violet Light). The drugs improve general body resistance and stimulate regeneration of tissue. The Japanese have demonstrated remarkable results with these when used in leprosy cases. Burns and frostbite responded with gratifying acceleration, while benzine burns and boiling water burns, especially, showed quick improvement.

Japan has long been noted as the most active earthquake land area in the world. No other country remotely approaches her average of 4,000 per year. Japanese scientists have made contributions of great importance in the field of seismology. Building laws governing wood and concrete construction have been strongly influenced by their researches and recommendations. NavTechJap investigators discovered that several large steel-frame hangars at the Yokosuka air field were of very unusual construction. This novel design was called the "Diamond Truss," from the diamond-shaped pattern formed by the intersecting arches. The skewed arches form the longitudinal bracing of the structure in addition to taking the regular loading. Admirably constructed to withstand earthquake shock, this design also resulted in a tremendous saving of steel—a major wartime objective. It should receive the consideration of American architects and contractors for any structure where large roofing areas are involved, such as hangars, garages, factory and mill buildings, armories, and gymnasia.

Supply Shortages

The Japanese, in spite of considerable stock-piling, soon encountered serious shortages in basic materials. The principal metallic shortage was nickel. Molybdenum was used in conserving nickel, until it, too, became scarce. Tungsten, although relatively plentiful at the beginning of the war, in time became a critical material. Some very interesting research was undertaken in the field of high temperature alloys for gas turbines and rockets, because of the scarcity of nickel and cobalt. Inferior iron-chromium alloys had to be substituted in the field of resistance wires in place of the conventional nichrome types. Their copper was of high quality but of such short supply that high-grade conductors were used only for the most pressing applications, such as aircraft.

Petroleum was the "Achilles heel" in the Japanese armor, and her lack of this precious fuel was the fundamental cause of her downfall. When the Japanese superbattleship *Yamato* made her suicidal sortie southwest of Kyushu in the waning months of the war, she was powered by edible refined soya bean oil. US Navy planes sank the soya bean-burning warship 7 April 1945, when she was intercepted enroute to attack American shipping at Okinawa.

Lack of oil resources kept scores of Nipponese ships lying immobile in Kure and other ports. Many of her battleships and cruisers were sitting-duck targets, easily sunk by bombs and torpedoes dropped by our airmen.

The Mission's search for data and equipment on Japanese petroleum research seemed hopeless, until the remains of a laboratory were discovered at Ofuna. Most of the documents and data were said to

have been destroyed, but enough remained to indicate that a sizeable establishment was once in operation there. Again, the Japanese engineers, draftsmen, scientists, and research men formerly employed in the laboratory were assembled to duplicate plans, drawings, and experimental data which had been developed. Strangely enough, the Japanese scientists took considerable pride in accomplishing this work to demonstrate the extent of their advancement. The net result was a complete disclosure of Japan's petroleum research.

Japan's efforts to find substitute fuels were frantic, and to a limited extent effective, but entirely inadequate. Until the beginning of the war, the Japanese Navy's chief source of diesel and bunker fuel was imports from California. This stock pile was exhausted in 1942, and cracked residues from Sumatra and Borneo crudes were then utilized as bunker fuels. In 1944, due to Japanese tanker losses to US submarines, research and practical testing were undertaken on both diesel and boiler fuels to develop substitutes. By the spring of 1945, aircraft carriers were utilized as tankers to bring motor gasoline from Singapore to be used as charging stock in the manufacture of even more desperately needed aviation fuel.

Satisfactory diesel fuels were produced from coconut oil, hydro cracked; pressed copra oil; esterified copra oil; and soya bean oil. Pine root oil was used, too, but it had a tendency to leave gummy deposits in the engine. A determined effort was made to develop an industry for converting coal into oil, but the results were comparatively insignificant. As a matter of fact, the outputs of oil from shale at Fushan, until 1944, exceeded the combined output from all coal conversion processes.

During the last year of the war, the Japanese had considerable success with a program for producing alcohol and using alcoholic aviation fuels. For instance, they were able to produce 1 pound of ethyl alcohol from the fermentation of 11 pounds of sweet potatoes. This, in turn, necessitated vital decisions about which varieties of potatoes were best for food and which best for fuel, and how the two should be apportioned to keep the nation alive to fight.

By the spring of 1944, the supply of cane sugar and molasses from Formosa, Java, and the Philippines was decreasing, and more emphasis was placed on Manchurian grain as a raw material source of ethyl alcohol. Finally, butanol plants were converted to the production of ethyl alcohol. Thus were the Oriental and Occidental opposed in mortal—and technological—combat: the Japanese converting his rubber into gasoline and the American converting his gasoline into rubber.

Such were some of the highlights reported by the Mission.

While we strive to assure the Army first-class leaders and first-class men, we must, at the same time, provide it the best equipment for its missions. A program for research and design of new equipment is an obvious necessity, but simplicity should be stressed more than has been our practice in the past. We Americans are inclined to confuse the biggest, most complicated, and most durable with the best, whereas, in war, the simple and expendable weapon may, in the light of time and production facilities, be the most satisfactory.

General of the Army Dwight D. Eisenhower

Land Defense Against Airborne Attacks

Colonel Paul D. Adams, *Infantry*
Director, Department of Operations and Training

The ideas expressed in the following article are the author's and do not necessarily reflect the doctrine of the Department of the Army or the Command and General Staff College.—The Editor.

THE flexibility inherent in airborne operations makes these operations important strategically and tactically. This flexibility results from the wide choice of targets open to the attacker, the speed with which airborne operations can be projected, and the increased possibility of the attacking force obtaining tactical surprise. Well-organized and well-executed defenses against airborne attacks are essential. The over-all defense against them involves three things: air defense, civil defense, and land defense.

The purpose of this article is to discuss the land defense problem from the viewpoint of the land defense forces involved. Air defense and civil defense matters will be mentioned only to the extent necessary to establish a framework for a more detailed discussion of the land defense.

The threat of an airborne attack exists when an enemy has the requisite superiority in combat aviation, the necessary transport and troop carrier aircraft, trained airborne forces, and the necessary bases from which to launch an operation.

Purposes of Airborne Attacks

An airborne attack may be launched by a belligerent for one, or a combination, of the following purposes:

1. To destroy vital installations, such as an industrial plant not vulnerable to conventional bombings, or a port in a theater of operations.
2. To seize and obtain control of an area producing vital raw materials.
3. To rupture vital communications.
4. To seize important base areas, or to deny them to other powers.
5. To neutralize bases from which attacks may be launched on the homeland of the airborne forces.
6. To furnish support to other operations, or to exploit successes attained by other means.
7. To establish an airhead from which large-scale, independent operations may be conducted.

Small or lightly defended objectives may be attacked directly or from nearby landing areas (drop zones). Such attacks require immediate active defense by local security forces assigned to protect the target. Small airborne attacks of this

Ground elements employed in defense against an airborne attack must be highly mobile and strong in armor. There must be local security forces, mobile containing and striking forces, and strategic reserves

nature may be conducted as sneak raids, or sacrifice missions, wherein the enemy supports the airborne force only sufficiently to land it on its target. In operations of this nature, the attacker may be prepared to lose the entire force as an effective military force and consider the price cheap if the airborne mission is accomplished. It is considered that this type of attack would be launched only against compact objectives of extreme importance.

Large airborne forces will be required to accomplish missions directed against a large, well-defended target, or to establish a firm airhead for large-scale, independent operations to be projected from the airhead. In these cases, it will be necessary for the attacking forces to select landing areas near the airborne objective. However, the landing areas must be sufficiently separated from the objective to allow space for the establishment of a firm airhead to permit the build-up of forces and supplies necessary for execution of the airborne mission. Under favorable conditions of terrain and with a good road net, it is considered feasible for an airborne division to seize and control an area approximately 5 miles in diameter. An airborne corps can seize and control an area about 14 miles in diameter.

Airborne Attack Phases

The large airborne attack falls into three phases. During each of these phases, it is mandatory that certain important measures are successfully accomplished by the airborne forces. Otherwise, the operation fails. The three phases are as follows:

Phase I includes preliminary air reconnaissance; aerial bombardment to isolate and disrupt communications in the target area; and the initial landings to include firm establishment of the assault force in the airhead area.

Phase II includes the defense, expansion, and improvement of the airhead, and the reception of the build-up of forces and supplies necessary for the execution of the airborne mission.

Phase III includes the offensive operations launched from the airhead against the airborne objective to accomplish the airborne mission. This phase also includes the defensive operations necessary to maintain the stability of the airhead.

On the basis of World War II experience and current developments and thought, it is estimated that an operation employing an airborne corps as an initial force will require 2 days for Phase I. Three days will be required for Phase II. An indeterminate period of time, depending on the particular situation, will be necessary for Phase III. Small forces with adequate air support will require shorter periods of time for each phase. In the case of very small, sneak raids, or sacrifice missions, Phases II and III may be very brief indeed.

An attacking airborne force has two important weaknesses which receive close attention by the defender. The first weakness is the fragility of the air line of communications. The second is the initial weakness of airborne forces in antitank weapons, armor, medium and heavy artillery, transportation, and logistical support.

In general, the objective of the air defense is to prevent an airborne operation from being launched by attacking the bases of the enemy. If this fails, the airborne force should be attacked while it is airborne, in order to inflict maximum damage on it. Air defense is a joint operation involving air forces, naval elements, antiaircraft artillery, and communication facilities, supported by necessary combat and service elements.

Civil Defense

Civil defense has the general mission of accomplishing disaster relief, rehabilitation, and the reconstruction of damage to

civil communities and installations resulting from enemy action or natural calamity. Civil defense agencies must be organized at national, regional, state, and local levels for this task. Civilian personnel control, constitute, and operate all civil defense agencies. Civil defense functions in conjunction with both air defense and land defense.

Attacks on the enemy bases are considered the most effective means of inflicting defeat or heavy damage on hostile airborne forces. However, no airtight air defense has been developed. Since the attacker must have had initial air superiority to justify an operation, there is a strong probability that some of his airborne forces will reach the designated landing areas. Those forces that successfully reach the landing areas must be destroyed before they are able to execute their airborne mission. This is the task of the land defense.

Coordination and cooperation between air defense, civil defense, and land defense activities must be accomplished at each level of command or control, in order to make the over-all defense against airborne attacks fully effective.

The land defense requirement that hostile airborne attacks be met and destroyed is a joint operation requiring army forces, tactical air forces, and necessary combat and service support elements. Naval elements and ground elements of the air force may be included in the land defense forces. The land defense forces must be highly mobile and strong in armor in order to exploit the peculiar vulnerability of airborne forces to armored attack.

Land defenses against airborne attacks must be accomplished so far as possible within the framework of the general defensive arrangements in order to obtain the maximum economy of force. Planning

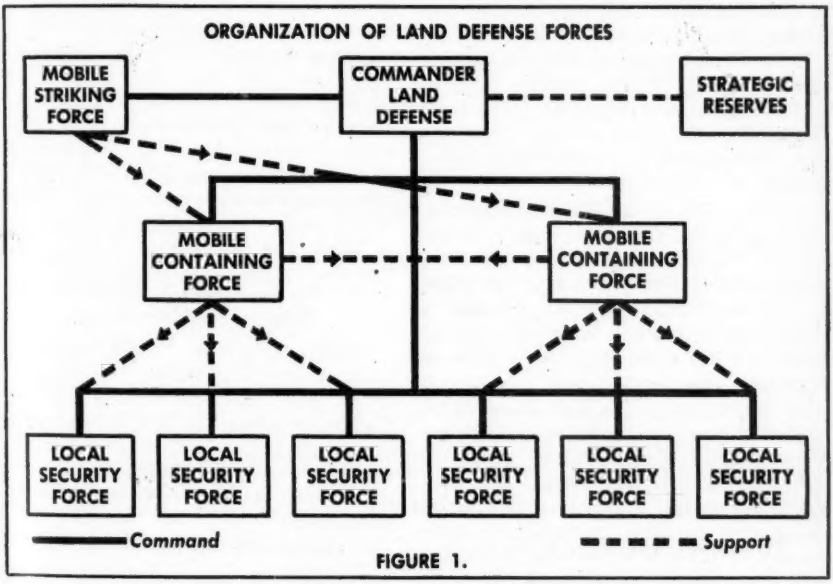


FIGURE 1.

follows the same general procedures that apply in planning other operations.

Analysis of Areas

As a preliminary to preparing an estimate of the situation where an airborne threat exists, a detailed analysis is made of the area to be defended. This analysis includes:

1. Determination and evaluation of usable airborne landing areas.
2. Determination of possible airborne targets and their relative importance.
3. Routes of communication connecting usable landing areas, possible targets, and available assembly areas for defending forces.
4. Characteristics (including weaknesses) of airborne attack.

On the basis of available intelligence, information concerning the area to be defended, and the forces available for the general defense, an estimate of the situation is prepared. From the estimate, a broad plan or decision is developed as to what is to be done to meet the over-all defensive requirements.

In organizing for the land defense, four typical forces are required. They are local security forces, mobile containing forces, mobile striking forces, and strategic reserves (see Figure 1). These forces, except for strategic reserves, are commanded by the commander who is charged with the defense of the land areas involved. Strategic reserves are placed under the control of the commander of the land defense when required by the situation.

Local Security Forces

Local security forces are forces whose primary function is to protect a single important installation or locality from close-in attack. Local forces include antiaircraft artillery, and personnel and units stationed at or near an installation to be protected. Local security forces protecting installations of extreme importance may be augmented by strong combat elements such as regimental combat teams or comparable combat formations, organized for the task to be accomplished. Local security forces prepare defensive works from which the installation may be defended. Mobile combat elements augmenting local security forces remain mobile in order to move promptly to meet and to defeat the enemy if that is within their capability. If defeating the enemy is impossible, the local forces delay the approaching enemy pending action by larger supporting forces. As a last resort, they occupy and fight from close-in, prepared positions. All local security forces, including augmentations, are placed under a single commander. He receives his orders from the land defense commander who is responsible for the over-all defense of the area in which the installation that is being guarded by the local security forces is located.

Mobile Containing Forces

Mobile containing forces are highly mobile forces stationed at strategic points in an area containing one or more important installations. They may comprise combat formations which augment local forces, or they may be separate commands contributing to the security of several installations.

The mission of a mobile containing force is to move against the enemy and to interpose its strength between the enemy and the installation or installations being defended from attack. By offensive action, the mobile containing force seeks to destroy the hostile airborne force. In case the destruction of the hostile airborne force is beyond the capabilities of the mobile containing force, it aggressively delays hostile movement from the airhead pending action by the mobile striking force. An armored cavalry group, reinforced by artillery, infantry, and engineers, makes a suitable mobile containing

force. Other suitable formations are armored combat commands and regimental combat teams. Mobile containing forces not employed in augmenting local forces are commanded by the land defense commander responsible for the over-all security of the area in which the mobile containing force is stationed.

Mobile Striking Force

The mobile striking force is a powerful combat force constituting the heart and strength of the land defense against airborne attacks. Its mission is to close with the hostile forces and to destroy them by offensive action. Its size is determined by the hostile airborne capability; it is large enough to justify offensive action. It is a highly mobile, balanced combat force, strong in armor and antiaircraft artillery and supported by tactical air elements. Large areas, determined by the time-space factors involved, are assigned to mobile striking forces for defense. The commander of the mobile striking force exercises unified command over all land defense forces assigned to his force.

Strategic Reserves

Strategic reserves are made available to reinforce one, or more, mobile striking forces. They are combat forces of such strength that unquestionable superiority of force rests with the land defense forces when they are committed. Strategic reserves may move by motor, rail, or air transport. For employment, they are normally attached to the mobile striking force upon arrival in the area where they are to be employed.

All forces are stationed with respect to the time and space factors involved in their commitment. Consideration is given

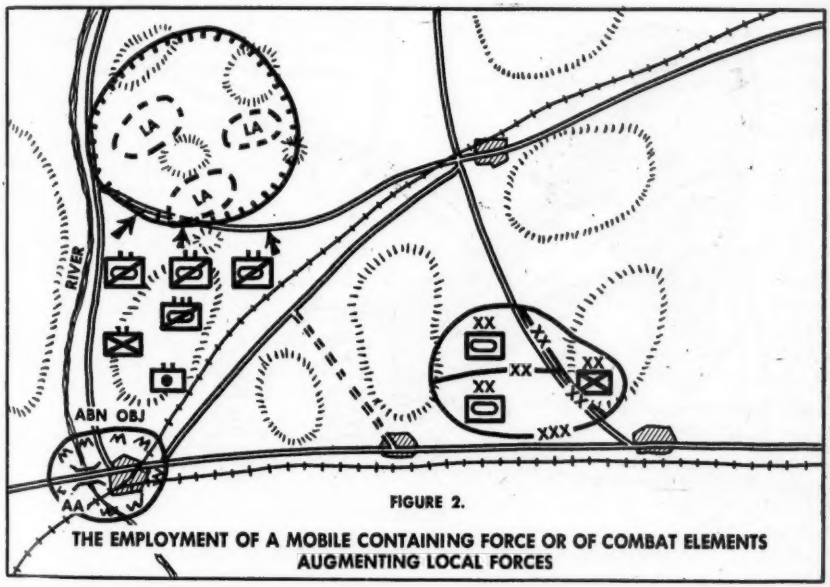


FIGURE 2.

THE EMPLOYMENT OF A MOBILE CONTAINING FORCE OR OF COMBAT ELEMENTS AUGMENTING LOCAL FORCES

to the enemy's capability of interfering with their operations. Increased enemy capability in this respect may reduce the area that may be successfully defended by a given force. Local security forces are naturally near the installation they serve, although mobile combat forces augmenting local security forces may be somewhat detached from the guarded installation to insure freedom of action. Combat forces augmenting local forces

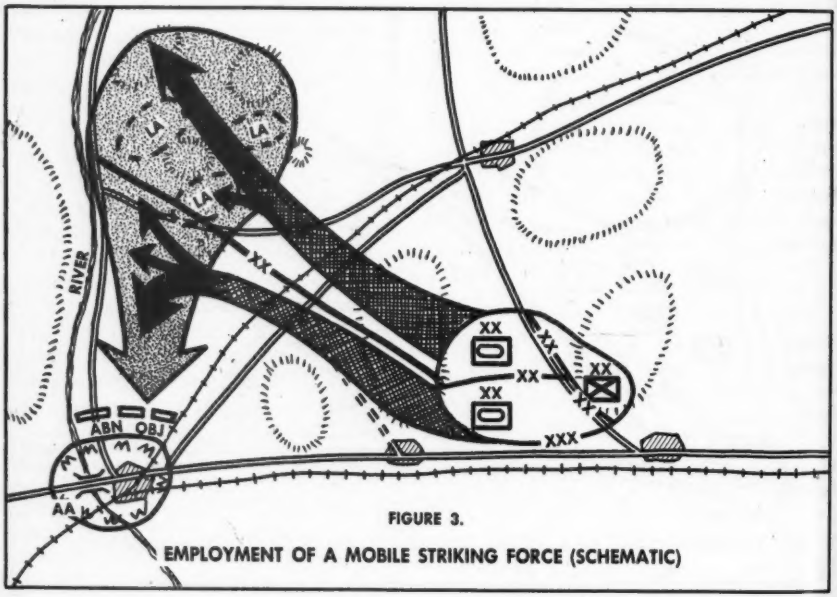


FIGURE 3.
EMPLOYMENT OF A MOBILE STRIKING FORCE (SCHEMATIC)

avoid losing their mobility and shock action by remaining ready to strike promptly with maximum force. Close-in defense by a mobile element is employed only as a last resort.

Mobile striking forces are stationed in accordance with the principles regarding the location of reserves in the combat zone under defensive conditions. Measures are taken to prevent premature involvement in the battle; to provide cover, concealment, and an air defense which will minimize enemy interference with movement; and to avoid being too distant from possible landing areas to prevent employment at those times when an enemy is most vulnerable.

Strategic reserves are stationed in accordance with the principles regarding location of reserves, in operations involving large units, and in full appreciation of the applicable time and space factors as determined by the mode or modes of transportation to be employed.

Conduct of the land defense demands that the defending forces take full advantage of the characteristics of airborne forces and their peculiar vulnerabilities.

Employment

When an alert is ordered as a result of information obtained from the early warning system operated in connection

with the air defense, all land defense forces make final preparations for the execution of their mission or missions. Immobile local security forces man their defenses, and mobile elements prepare for their planned employment.

As soon as the location of the hostile landing area is determined, the mobile containing force moves out to execute its mission of (1) destroying the hostile forces, or (2) aggressively containing or delaying the enemy until the arrival of the mobile striking force (Figure 2). Antiaircraft artillery fires on enemy airborne targets within range; when not so engaged, it fires at ground targets in support of land forces. While these things are taking place, an intense air battle is taking place all along the enemy air line of communications reaching back to the enemy bases. The mobile striking force prepares for the prompt execution of its mission.

Timing the Commitment

Timing the commitment of the mobile striking force is of great importance. There are two times that are most opportune for the mobile striking force to strike:

1. When the enemy has made his assault and before he has been materially reinforced.

2. When the enemy has committed himself to a major movement from the airhead.

In the first case, the enemy is caught with only limited and partially disorganized forces, insufficient weapons, and inadequate supplies. Powerful attacks launched directly against the airhead at this time can destroy the assault elements and make an enemy build-up in the airhead impossible.

In the second case, the enemy is caught with a weak airhead perimeter defense, with the mass of his forces concentrated and moving toward the airborne objective, and with an ever-lengthening and vulnerable land line of communications (Figure 3). Under these conditions, the mobile striking force attacks to accomplish the following:

1. To cut off the offensive column from its airhead base and to annihilate it by attacking up the column from its base.

2. To penetrate the airhead perimeter defense, to overrun the area of the airhead, and to destroy all forces encountered.

The action of the mobile striking force is characterized by speed and shock action. It is a defense accomplished completely by offensive action. This is made possible by proper composition of the force, by detailed planning, and by frequent rehearsals to insure maximum coordination between the weapons and the forces involved. Each attacking column is spearheaded by armor which by-passes strong resistance and continues onward to accomplish the maximum disruption of the enemy forces. The reduction of by-passed elements is left to follow-up forces.

All forces must be prepared to deploy at night, and to launch night attacks under urgent conditions. A night deployment and an attack at daybreak over previously reconnoitered terrain minimizes the enemy's ability to interfere with the movement of the defending forces. Close engagement with the enemy limits his ability to interfere in the attack by means of air action. The attack continues until the mobile striking force succeeds in disorganizing and defeating the airborne forces. The battle area is thoroughly mopped-up to prevent any by-passed hostile elements from reforming to resume the attack.

As soon as the situation is under control, those forces no longer required in the battle area are released by the commander of the mobile striking force. The released forces resume their stations, reorganize, and prepare for subsequent operations as required by their mission and the situation.

Situation: Normally Abnormal

Lieutenant Colonel John D. Cole, *Corps of Engineers*
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PROBABLY the main reason why the application of the principles of war is called an art rather than a science is that no two situations are ever the same. It has been said that in speaking of military principles and techniques, the words "always" and "never" can only be used by saying that we can never use the word "always." Such a statement may be a little strong, but certainly the blind application of a "normal" solution to any situation has caused more grief on the battlefield and in the military classroom than any other one factor. The principles of war, which are the basis of the military art, are somewhat contradictory even among ourselves, and it is the balancing of these principles and the achievement of a harmonious compromise among them that make sound leadership.

From the time that we begin to cut our military teeth, we hear again and again the phrase "normal situation." Virtually every problem and every maneuver in all of our training is based on this "normal," despite the fact that the sterner school of combat has taught us again and again that only the abnormal is normal, and that situations which we can solve by rote are unusual indeed.

By no stretch of the imagination could any of the World War II campaigns in North Africa be regarded as normal or usual. Yet for months and years, they formed an appreciable portion of the fighting. By normal standards they were unique, to say the least. Yet a detailed analysis shows that in every case success was due to a sound application of principles to the situation at hand.

In April 1943, the II United States Corps was moved to an active zone in Northern Tunisia (see Figure 1). The entire Corps was moved directly across the rear of a British Army. This rather remarkable logistical feat was performed at the insistence of General Bradley, who wished to fight his Corps as a unit in a decisive locality. That he was right in this instance was amply proved by the success obtained. The 9th Infantry Division, commanded by Major General M. S. Eddy, found itself committed to a zone some 30 miles wide (see Figure 2). Only one road worthy of the name existed in the division zone, and the terrain was indeed a logistician's nightmare. It consisted of a jumbled mass of rugged hills, densely covered for the most part with Algerian brier. This picturesque vegetation grew to a height of some 6 to 8 feet, and was in many places so thick that it was necessary for an individual soldier to crawl on his hands and knees in order to penetrate it. Even the advance of small infantry units through such terrain presented a difficult problem, and the movement of supporting weapons and supplies was a gigantic task.

Added to the problem of terrain was that of the enemy. The *Afrika Korps* was by no means beaten as yet. The German force opposing the 9th Division had had

weeks and months to fortify and consolidate the naturally strong terrain. This they had done as only veterans know how. Astride the main road to Mateur was the Green Hill-Bald Hill position which was a veritable fortress. The British troops from whom the 9th Division had taken over had been thrown back three times by this position. A new attack was now pending and this was one of the division's two objectives (see Figure 2). A 30-mile zone, a rugged mass of jungle-covered hills, a determined enemy superbly trained and dug into a battle-proved position, and two objectives, 20 miles apart! To say that the situation was a difficult one would be something of an understatement. Certainly it was not "normal."

Fortunately, the division was considerably reinforced. Attached was the *Corps Franc d'Afrique (CFA)*, which in rifle

An attack by the 9th Division in North Africa provides an example of the thesis that a "normal" situation is seldom encountered, and that much of the art of war consists of learning to expect the unexpected

strength was the equivalent of an additional infantry regiment. It consisted, however, of French colonial troops whose organization and training left something to be desired, and it was woefully weak in supporting weapons and in transport. Also attached to the division were the 91st Reconnaissance Squadron, two tank destroyer battalions, a battalion of 155-mm howitzers, a battery of 155-mm guns and a battalion of self-propelled 105-mm howitzers. Due to the wide frontages involved, all of the Corps Artillery designated to support the 9th Division had been attached to the Division. In a supporting role was the 20th Engineer Combat Regiment, a very important addition in view of the lack or roads.

The Division Commander and his staff recognized at once that the German defenses west of Jefna would have to be outflanked—that the relative cost of even a successful direct attack would be prohibitive. The German line had to be penetrated at some other point, a flank created, and the defenders forced to withdraw by some means other than frontal assault. The question then became whether to envelop the Jefna position from the north or from the south. The factors involved were these: to the north, the terrain was more difficult; movement and supply would present a gigantic problem; but here the German defenses were less highly organized and less extensively manned. For this reason and because cover and concealment were much better in the north, it was felt that surprise could be attained by an attack in the north, but that it would be difficult if not impossible in the south. On the other hand, an envelopment to the south would have somewhat easier terrain, but it would be an attack against stronger positions, probably without the benefit of surprise. Moreover, the southern envelopment would tend to drive the enemy back along his natural line of retreat towards Mateur and Bizerte, while a northern attack executed swiftly might cut off a considerable portion of the defenders.

With these considerations in mind, it was decided to envelop the northern flank. The operational plan was as follows: The 47th Infantry (see Figure 2) was to execute a holding attack along the main road against the Jefna position. This was designed not to carry the position frontally but to occupy the defenders and to conceal the envelopment. The 39th and 60th Infantry Regiments were to make the main effort, attacking initially up the Sedjanane Valley. Objectives and bound-

The attack of the 9th Infantry Division in Northern Tunisia in April 1943 was over "a jumbled mass of rugged hills, densely covered . . . with Algerian brier." Above, a ration supply line of the 60th Infantry Regiment. Below, mules were provided to regiments to supply their forward units during the operation.—US Army photos.

Above, on the road to Mateur, Northern Tunisia, American troops ride by a knocked out German Mark VI tank. Below, a gun position of Battery "B," 60th Field Artillery. All pictures appearing on this and the opposite page were taken on 26 April 1943, during the II Corps attack in North Africa.—US Army photos.

aries for this attack were designed to cut off the Jefna position and to destroy its defenders. On the extreme left flank, the *Corps Franc* was to attack between the 60th Infantry and the coast. It was believed that this area was most lightly held and that an attack through it could serve to add weight to the main effort. This attack also was pointed directly at the division's secondary objective. To the south, the 1st Infantry Division was also attacking under the Corps plan, but there would be a gap of some 6½ miles separating the two divisions. To fill this gap, the 91st Reconnaissance Squadron was directed to maintain contact with both divisions and to patrol vigorously to the east within its zone. It was recognized that leaving this zone lightly held involved some risk, but intelligence indicated that the enemy capabilities for a major counterattack were almost non-existent.

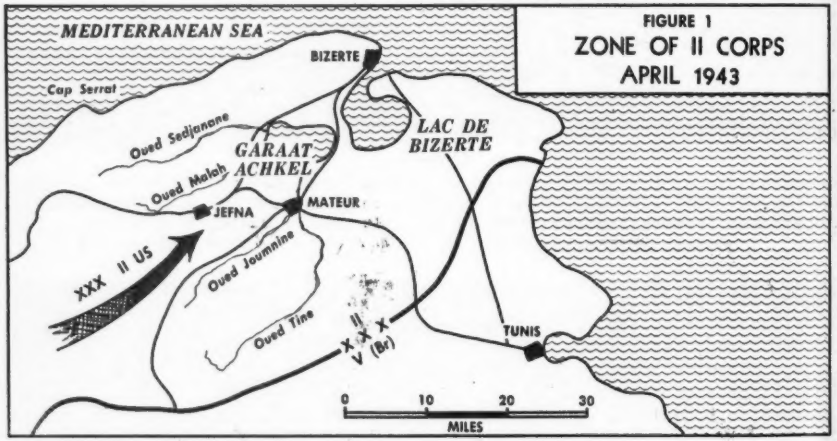


FIGURE 1
ZONE OF II CORPS
APRIL 1943

The extreme width of front created a difficult problem for the artillery commander, who was forced to scatter his units widely. Although the organic light battalions were employed in their normal direct support roles, the artillery was divided into two groups, one to be employed on the north and the other on the south. Thus, even though the units were widely separated, artillery control was centralized until the pursuit phase began. It was realized that there would be inadequate close protection for the artillery positions, and that this situation would grow progressively worse as the advance continued. Accordingly, the 9th Reconnaissance Troop and some tank destroyer elements were attached to the Division Artillery and employed in protective roles, largely in the Sedjanane Valley. Again, we find here an unusual solution, necessitated by an unusual situation.

If the operational problem was abnormal, certainly the logistical situation was not less so. The bulk of the Division would be operating for an indefinite period, practically without benefit of roads, over an exceedingly wide front. The CFA was virtually without transportation of any kind, and the Division was reinforced to almost twice its normal strength. The problems of supply, transportation, main-

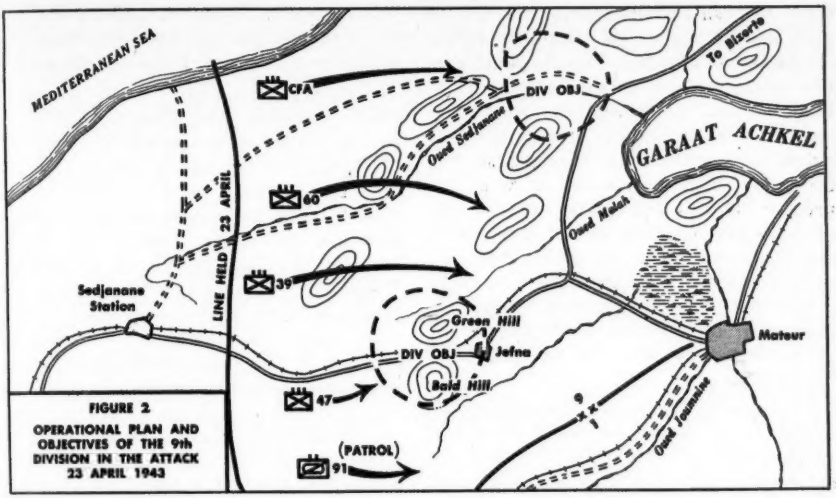


FIGURE 2
OPERATIONAL PLAN AND OBJECTIVES OF THE 9th DIVISION IN THE ATTACK 23 APRIL 1943

tenance, and evacuation were enough to provide food for thought to even the most experienced G-4.

The twin problems of supply and transportation were solved by a combination of means. First, the Division established dumps for Class I, III, and V supplies well forward. Divisional units drew supplies from these dumps, and, where necessary, established their own dumps as far forward as possible. The infantry regiments, which were operating beyond the limit of possible vehicular travel, were given mules to supply their forward units. Divisional and supporting Corps engineers, meanwhile, were bending every

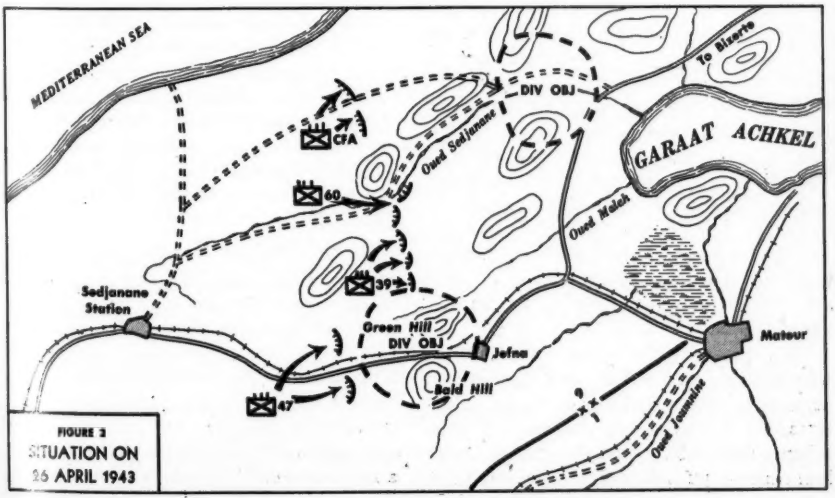


FIGURE 3
SITUATION ON 26 APRIL 1943

effort to push the road net forward, thus allowing the regimental dumps to follow the troops at a distance which would permit supply by mule transportation. Maintenance was performed in a normal manner, even though the load on the divisional units performing this function was extremely heavy. Evacuation was unusually difficult. The terrain and the lack of roads precluded the use of ambulances except in rear areas, and evacuation had to be accomplished by hand litter in many areas. Collecting stations were pushed as far forward as the roads would permit, but it was necessary to provide additional litter bearers.

The attack began at daylight on 23 April and proceeded generally according to plan, except that attacking units did not move at anywhere near the anticipated rate. Actually, the slow progress was due more to terrain difficulties than to the resistance offered by the enemy, although the latter was considerable. By 26 April, the situation was as shown in Figure 3. It had become apparent that the French did not have sufficient power to maintain their advance abreast of the 60th Infantry, and it was felt that the attack of the 39th Infantry would alone be sufficient to outflank the Jefna position. Accordingly, the 60th Infantry was turned northeast to outflank the resistance in the French zone. Such a move involved, of course, some element of risk, since it was bound to produce a large gap between the 39th and 60th Infantry Regiments. This risk was considered acceptable, however, since the available intelligence indicated strongly that there was little likelihood of a large-scale counterattack. Here again we find an unusual solution dictated by an abnormal situation.

This change in the scheme of maneuver was entirely successful, and the attack progressed slowly but surely to its objectives. By 2 May, all objectives had been taken and the pursuit phase was launched—a pursuit which culminated not only in the fall of Mateur and Bizerte, but in the crushing of Axis resistance in Africa and the end of the campaign.

Certainly we can say that the 9th Division's operation was anything but what we have come to call a normal situation. First, the division was *attacking* in a 28-mile zone. Second, it was reinforced to almost twice its normal strength, which placed a tremendous load on all of its logistical and administrative operations. Third, the terrain was rugged, almost a jungle in many places, and the road net was almost non-existent. Fourth, the artillery in support, including Corps Artillery, was controlled entirely by the Division and it was necessary to attach reconnaissance and tank destroyer elements to the artillery in order to provide close protection. Fifth, the logistical situation was such as to require extensive use of animal transport and the operation of forward dumps for all classes of supply by Division and in some cases even by regiments. Finally, in the conduct of the attack, it was necessary to split the main effort and accept the calculated risk of creating a large gap between the attacking regiments.

Each of these elements of the situation required its own solution, and the commander did not hesitate to adopt an unorthodox plan wherever and whenever it was required. In every case, however, an examination of the solution reveals that it adhered closely to the established principles of war—the basis of military decision.

Military history is filled with such examples as this one, and our most experienced commanders are loud in their claims that seldom if ever were their units faced with a "normal" situation. Now, more than ever before, the successful commander must base his decisions not on a stereotyped solution but on the sound application of principles to the "normally abnormal" situation.

The Army Group G-3 Section

Former Instructor, Command and General Staff College
Lieutenant Colonel M. A. Solomon, *Field Artillery*

THE subject of organization immediately suggests a chart upon which the conventional military method of showing the organic structure of a unit is shown. But what concept is to be formed when no such concrete graphical picture exists? Such a situation confronted the army group commanders at the beginning of World War II.

Since there is no prescribed table of organization, the staff of an army group is organized within the means furnished in accordance with the mission, situation, and desires of the army group commander. It can be expected that the structure of such a staff will, in general, be along standard lines and in accordance with accepted doctrine. To a certain extent, therefore, the army group staff will be similar to the staff of an army or a corps, with variations in size and detail only. The base of the staff organization will undoubtedly be the four general staff sections: personnel, intelligence, operations, and logistics.

Any organization will prove acceptable which serves the commander and troops of an army group efficiently. Under this concept, it is relatively unimportant, indeed undesirable, that the details of organization be fixed. Many unpredictable questions will arise and require spot solutions. Such questions, in an over-all examination of the army group staff organization, are relatively unimportant and can be resolved when the particular staff is actually formed.

The same latitude that the army group commander is granted in forming his staff will usually apply to the general and special staff section chiefs in organizing their sections, with certain limitations in regard to the number of personnel which may be used. After a period of experimentation, the organization will probably approximate that shown on Chart 1. This is a typical organization embodying the best features employed by the several army groups in the recent war.

Personnel Required

A favorite complaint of the front-line troops in World War II concerned the numbers of officers and enlisted men in higher headquarters. While figures alone do not tell a complete story, frequently their magnitude can be the basis for an argument. The typical organization shown on Chart 1 would require approximately 300 officers. While this is an average figure, based upon an average army group, wide variations can be expected, depending on the circumstances of organization.

Quite a large organization is required

Like the army group staff, the army group G-3 section has no fixed organization, its composition being determined mainly by the mission assigned, the means allocated, and the desires of the commander

to service the army group staff. This will include enlisted assistants for the staff sections, as well as housekeeping, transportation, security, and signal elements. The strength visualized in this instance would be approximately 6,000. Here again, the strength of army group troops, like the staff, will vary widely in different army groups. Often, the army group troop list will show a strength as high as 50,000 or more. This figure should not be confused with the actual army group troop strength as it will include other units which are carried on the station list and strength returns under army group troops for administrative convenience. Frequently, in the past, units assigned but not yet joined, units on duty outside the combat zone, and some units with the armies have been carried as army group troops.

Organization of the G-3 Section

With the general outline of the army group staff in mind, an examination of the G-3 section discloses that again there is no prescribed organization. Thus, the distribution of duties as shown on Chart 2 can only be regarded as an example. Once again, the goal is economical and efficient operation. Different commanders and different G-3s will have different requirements. Accordingly, the section should be organized to meet the particular desires of the personalities involved. The most powerful influencing factor is the mission assigned to the army group. It then can be expected that the organization shown on Chart 2 will be modified under different circumstances. For example, administration may be designated as a separate branch instead of being in the office of the deputy G-3. A training branch may be established. Flexibility certainly must be the keynote in such a large organization under such varying circumstances.

Allocation of the functions to the several branches of the army group G-3 section is shown on Chart 2. Functions of the operations, plans, organization, troops, liaison, and air branches are distinctly and clearly enunciated. Functions of the deputy G-3 and administration require no further explanation other than that given on Chart 2.

Operations Branch

The operations branch of the army group G-3 section, in the type organization shown on Chart 2, is the largest of the G-3 branches. It is composed of 12 officers, 1 warrant officer, and 19 enlisted men. Its functions are wholly concerned with the receipt, evaluation, recording, and dissemination of operational information pertaining to the tactical situation. The branch further serves the commander, the G-3, and other staff sections by continuously having available an accurate and up-to-date picture of the existing situation. This branch requires the services of officers of wide experience.

Specifically, the operations branch is charged with the responsibilities of maintaining the war room, with G-2 assistance; preparation of the G-3 periodic reports, with the assistance of G-2 in combined situation and intelligence reports; conduct of daily briefings for the commander, staff, press, with G-2 assistance along with such other staff sections as may have material to present; the maintenance of situation maps, for use in preparation of reports as well as for the general information of the headquarters and for visitors not authorized access to the war room; and current operations.

War Room

In a large headquarters, it is necessary to assemble in one place, under proper authority, all the pertinent factual data concerning the situation. A war room accomplishes this purpose. Here, the numerous tactical reports from subordinate,

adjacent, and superior headquarters, as well as reports from the army group agencies, are received, evaluated, and recorded. Here, also, verification and dissemination of information are accomplished. Accordingly, there is available, in one place, a reliable and complete situation on which the commander and staff can base decisions and plans. The war room thus becomes the logical place for briefings of the commander and staff.

The purpose of these periodic reports is to furnish appropriate headquarters with information upon which they may coordinate current operations and base future plans, and to serve as a factual historical record which may be used to study past operations. Two common types of the periodic report are normally employed: the written periodic report, which is submitted daily; and the radio or telegraphic summary of operations, which is

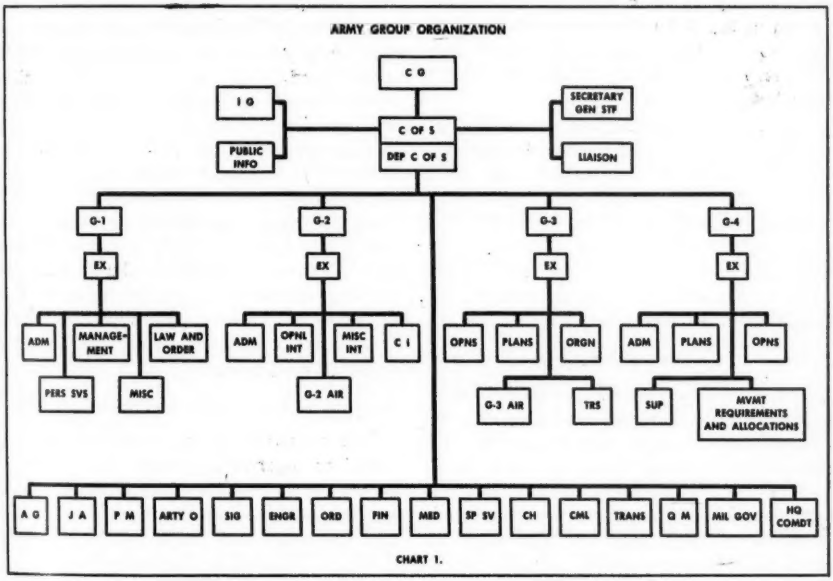


CHART 1.

Periodic Reports

In order that the higher command may have a carefully prepared, accurate report of events, periodic reports are of vital importance. These reports will include the daily combined situation and intelligence report, prepared with the assistance of G-2; G-3 daily operations report; monthly after-action report; and radio or telegraphic summaries as directed by the theater Army commander. submitted as directed by higher headquarters, usually twice daily.

Due to the time lag in receiving and consolidating reports from subordinate units, the daily periodic report, which is submitted in writing, is of little immediate value at the army group level in planning and coordinating current operations. This is particularly true in a war of movement. It is essential that this report be factually correct in order that it

may reflect a true picture of past operations which will be studied in the future.

The compilation of the periodic reports is normally assigned to the duty officer from the G-3 operations section. Using a work sheet, he assembles the material for the reports from spot reports, periodic reports from subordinate units, and the reports of liaison officers with subordinate, adjacent, and supporting units. The duty officer then prepares a draft of the army group periodic report for the approval of the G-3 and chief of staff. Upon approval, a final copy is prepared and necessary action taken to give it proper distribution.

The radio or telegraphic summaries of operations, in conjunction with spot reports of important events, form the basis for coordinating current operations. These summaries will normally contain only brief statements of the changes in dispositions of major units since the last report. They are based upon similar reports received from subordinate units.

Current Operations

The operations branch is charged with current operations and operates in approximately the same manner as the G-3 operations branch at army and corps level. Current operations will include a continuous study of the situation to determine what changes, if any, are necessary in current operation orders of the army group to its armies. This may include modification or changes in the scheme of maneuver, boundaries between armies, objectives, allocation of means, and the employment of army group reserves. It is only in this manner that army group plans, which are habitually prepared well in advance and consequently are based upon assumptions, can be adapted to the developing and ever-changing situation. It is through the functioning of the operations branch that flexibility in army group operations is accomplished.

Plans Branch

The functions of the plans branch of the army group G-3 section may be broadly outlined as planning, preparation of letters of instructions or operation orders, and supervision of operational activities of guerrilla or partisan forces.

Planning

Planning is the principal and most important function of the plans branch. The size and diverse nature of the troop units of an army group demand that each operation be based on a detailed and carefully coordinated plan. Improvization at this level is never desirable and seldom satisfactory. The army group planning will usually be from one to three operations ahead of the current operation. Thus, the plan branch will be processing several future plans simultaneously, each of which will be in a different stage of completion. Even completed plans must be continuously scrutinized in light of the developing situation. In addition, plans for possible contingencies are continuously under development.

Letters of Instructions, Operation Orders

The preparation of letters of instructions or operation orders will include orders to subordinate armies implementing the planning of the plans branch. It will be noted that these orders are very rarely a surprise to the subordinate commander. Usually, they confirm what he has already received through verbal instructions and concurrent planning.

Guerrilla Activities

The actions of irregular or paramilitary forces may be a major or minor function of G-3 plans according to the number of such units available or potentially available. Full use of guerrilla or partisan forces is desirable. The planning for their employment must be such as to promote accomplishment of the mission, and

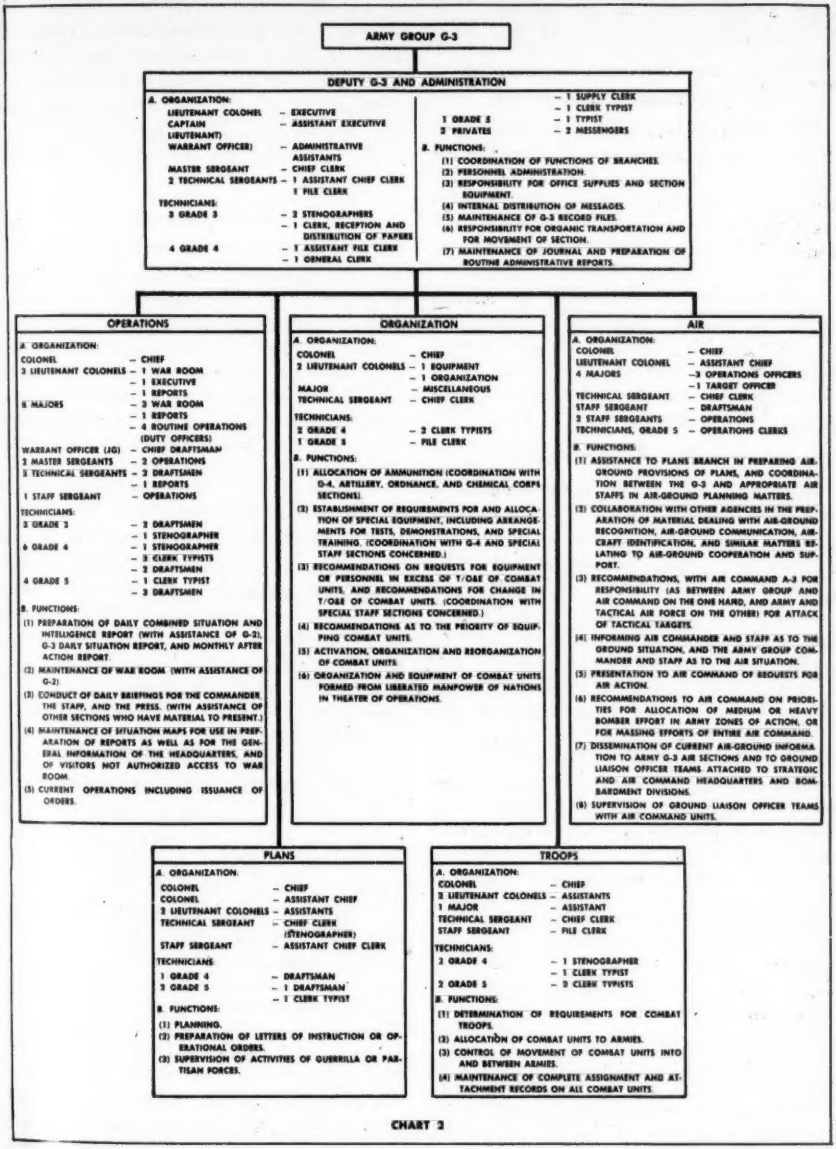

ARMY GROUP G-3
DEPUTY G-3 AND ADMINISTRATION
A. ORGANIZATION:
LIEUTENANT COLONEL – EXECUTIVE
CAPTAIN (LIEUTENANT) – ASSISTANT EXECUTIVE
WARRANT OFFICER – ADMINISTRATIVE ASSISTANTS
MASTER SERGEANT – CHIEF CLERK
2 TECHNICAL SERGEANTS – 1 ASSISTANT CHIEF CLERK
1 FILE CLERK
TECHNICIANS:
3 GRADE 3 – 2 STENOGRAPHERS
– 1 CLERK, RECEPTION AND DISTRIBUTION OF PAPERS
4 GRADE 4 – 1 ASSISTANT FILE CLERK
– 1 GENERAL CLERK
– 1 SUPPLY CLERK
– 1 CLERK TYPIST
1 GRADE 5 – 1 TYPIST
2 PRIVATES – 2 MESSENGERS
B. FUNCTIONS:
(1) COORDINATION OF FUNCTIONS OF BRANCHES.
(2) PERSONNEL ADMINISTRATION.
(3) RESPONSIBILITY FOR OFFICE SUPPLIES AND SECTION EQUIPMENT.
(4) INTERNAL DISTRIBUTION OF MESSAGES.
(5) MAINTENANCE OF G-3 RECORD FILES.
(6) RESPONSIBILITY FOR ORGANIC TRANSPORTATION AND FOR MOVEMENT OF SECTION.
(7) MAINTENANCE OF JOURNAL AND PREPARATION OF ROUTINE ADMINISTRATIVE REPORTS.
OPERATIONS
A. ORGANIZATION:
COLONEL – CHIEF
3 LIEUTENANT COLONELS – 1 WAR ROOM
– 1 EXECUTIVE
– 1 REPORTS
6 MAJORS – 3 WAR ROOM
– 1 REPORTS
– 4 ROUTINE OPERATIONS (DUTY OFFICERS)
WARRANT OFFICER (JG) – CHIEF DRAFTSMAN
2 MASTER SERGEANTS – 2 OPERATIONS
3 TECHNICAL SERGEANTS – 2 DRAFTSMEN
– 1 REPORTS
1 STAFF SERGEANT – OPERATIONS
TECHNICIANS:
2 GRADE 3 – 2 DRAFTSMEN
– 1 STENOGRAPHER
6 GRADE 4 – 1 STENOGRAPHER
– 3 CLERK TYPISTS
– 2 DRAFTSMEN
4 GRADE 5 – 1 CLERK TYPIST
– 3 DRAFTSMEN
B. FUNCTIONS:
(1) PREPARATION OF DAILY COMBINED SITUATION AND INTELLIGENCE REPORT (WITH ASSISTANCE OF G-2), G-3 DAILY SITUATION REPORT, AND MONTHLY AFTER ACTION REPORT.
(2) MAINTENANCE OF WAR ROOM (WITH ASSISTANCE OF G-2).
(3) CONDUCT OF DAILY BRIEFINGS FOR THE COMMANDER, THE STAFF, AND THE PRESS. (WITH ASSISTANCE OF OTHER SECTIONS WHO HAVE MATERIAL TO PRESENT.)
(4) MAINTENANCE OF SITUATION MAPS FOR USE IN PREPARATION OF REPORTS AS WELL AS FOR THE GENERAL INFORMATION OF THE HEADQUARTERS, AND OF VISITORS NOT AUTHORIZED ACCESS TO WAR ROOM.
(5) CURRENT OPERATIONS INCLUDING ISSUANCE OF ORDERS.
ORGANIZATION
A. ORGANIZATION:
COLONEL – CHIEF
2 LIEUTENANT COLONELS – 1 EQUIPMENT
– 1 ORGANIZATION
MAJOR – MISCELLANEOUS
TECHNICAL SERGEANT – CHIEF CLERK
TECHNICIANS:
2 GRADE 4 – 2 CLERK TYPISTS
1 GRADE 5 – FILE CLERK
B. FUNCTIONS:
(1) ALLOCATION OF AMMUNITION (COORDINATION WITH G-4, ARTILLERY, ORDNANCE, AND CHEMICAL CORPS SECTIONS).
(2) ESTABLISHMENT OF REQUIREMENTS FOR AND ALLOCATION OF SPECIAL EQUIPMENT, INCLUDING ARRANGEMENTS FOR TESTS, DEMONSTRATIONS, AND SPECIAL TRAINING. (COORDINATION WITH G-4 AND SPECIAL STAFF SECTIONS CONCERNED.)
(3) RECOMMENDATIONS ON REQUESTS FOR EQUIPMENT OR PERSONNEL IN EXCESS OF T/O&E OF COMBAT UNITS, AND RECOMMENDATIONS FOR CHANGE IN T/O&E OF COMBAT UNITS. (COORDINATION WITH SPECIAL STAFF SECTIONS CONCERNED.)
(4) RECOMMENDATIONS AS TO THE PRIORITY OF EQUIPPING COMBAT UNITS.
(5) ACTIVATION, ORGANIZATION AND REORGANIZATION OF COMBAT UNITS.
(6) ORGANIZATION AND EQUIPMENT OF COMBAT UNITS FORMED FROM LIBERATED MANPOWER OF NATIONS IN THEATER OF OPERATIONS.
AIR
A. ORGANIZATION:
COLONEL – CHIEF
LIEUTENANT COLONEL – ASSISTANT CHIEF
4 MAJORS –3 OPERATIONS OFFICERS
–1 TARGET OFFICER
TECHNICAL SERGEANT – CHIEF CLERK
STAFF SERGEANT – DRAFTSMAN
2 STAFF SERGEANTS – OPERATIONS
TECHNICIANS, GRADE 5 – OPERATIONS CLERKS
B. FUNCTIONS:
(1) ASSISTANCE TO PLANS BRANCH IN PREPARING AIR-GROUND PROVISIONS OF PLANS, AND COORDINATION BETWEEN THE G-3 AND APPROPRIATE AIR STAFFS IN AIR-GROUND PLANNING MATTERS.
(2) COLLABORATION WITH OTHER AGENCIES IN THE PREPARATION OF MATERIAL DEALING WITH AIR-GROUND RECOGNITION, AIR-GROUND COMMUNICATION, AIRCRAFT IDENTIFICATION, AND SIMILAR MATTERS RELATING TO AIR-GROUND COOPERATION AND SUPPORT.
(3) RECOMMENDATIONS, WITH AIR COMMAND A-3 FOR RESPONSIBILITY (AS BETWEEN ARMY GROUP AND AIR COMMAND ON THE ONE HAND, AND ARMY AND TACTICAL AIR FORCE ON THE OTHER) FOR ATTACK OF TACTICAL TARGETS.
(4) INFORMING AIR COMMANDER AND STAFF AS TO THE GROUND SITUATION, AND THE ARMY GROUP COMMANDER AND STAFF AS TO THE AIR SITUATION.
(5) PRESENTATION TO AIR COMMAND OF REQUESTS FOR AIR ACTION.
(6) RECOMMENDATIONS TO AIR COMMAND ON PRIORITIES FOR ALLOCATION OF MEDIUM OR HEAVY BOMBER EFFORT IN ARMY ZONES OF ACTION, OR FOR MASSING EFFORTS OF ENTIRE AIR COMMAND.
(7) DISSEMINATION OF CURRENT AIR-GROUND INFORMATION TO ARMY G-3 AIR SECTIONS AND TO GROUND LIAISON OFFICER TEAMS ATTACHED TO STRATEGIC AND AIR COMMAND HEADQUARTERS AND BOMBARDMENT DIVISIONS.
(8) SUPERVISION OF GROUND LIAISON OFFICER TEAMS WITH AIR COMMAND UNITS.
PLANS
A. ORGANIZATION:
COLONEL – CHIEF
COLONEL – ASSISTANT CHIEF
2 LIEUTENANT COLONELS – ASSISTANTS
TECHNICAL SERGEANT – CHIEF CLERK (STENOGRAPHER)
STAFF SERGEANT – ASSISTANT CHIEF CLERK
TECHNICIANS:
1 GRADE 4 – DRAFTSMAN
2 GRADE 5 – 1 DRAFTSMAN
– 1 CLERK TYPIST
B. FUNCTIONS:
(1) PLANNING.
(2) PREPARATION OF LETTERS OF INSTRUCTION OR OPERATIONAL ORDERS.
(3) SUPERVISION OF ACTIVITIES OF GUERRILLA OR PARTISAN FORCES.
TROOPS
A. ORGANIZATION:
COLONEL – CHIEF
2 LIEUTENANT COLONELS – ASSISTANTS
1 MAJOR – ASSISTANT
TECHNICAL SERGEANT – CHIEF CLERK
STAFF SERGEANT – FILE CLERK
TECHNICIANS:
2 GRADE 4 – 1 STENOGRAPHER
– 1 CLERK TYPIST
2 GRADE 5 – 2 CLERK TYPISTS
B. FUNCTIONS:
(1) DETERMINATION OF REQUIREMENTS FOR COMBAT TROOPS.
(2) ALLOCATION OF COMBAT UNITS TO ARMIES.
(3) CONTROL OF MOVEMENT OF COMBAT UNITS INTO AND BETWEEN ARMIES.
(4) MAINTENANCE OF COMPLETE ASSIGNMENT AND ATTACHMENT RECORDS ON ALL COMBAT UNITS.

CHART 2

their actions must be coordinated with that of the regular units of the army group.

Organization Branch

The general duties of the organization branch may be listed as the allocation of ammunition, establishment of requirements for and allocation of special equipment, recommendations on requests for equipment or personnel in excess of Tables of Organization and Equipment of combat units, priority on equipment of combat units, activation, organization, and reorganization of combat units, and organization and equipment of combat units formed from liberated manpower in the theater of operations.

Allocation of Ammunition

The task of allocating ammunition is a very important assignment at the army group level. There must be a careful inventory of the ammunition available. The tactical picture must be thoroughly understood. Then, with this information at hand, a sound recommendation must be made. Sometimes this recommendation will have a decided morale effect on the troops down to the lowest echelon, due to the actual rationing that is subsequently imposed. The assistant G-3, organization, coordinates this allocation of ammunition very closely with the G-4, artillery, ordnance, and chemical sections of the special staff.

Special Equipment

As combat progresses, there is a rather steady flow of special equipment into the theater. This is more understandable when it is realized that the more one learns about the enemy the easier it becomes to determine his weaknesses. Frequently, some special equipment is necessary to exploit such weaknesses. A constant study is consequently made to determine what types of special equipment are desirable. Once the special equipment is actually received, there must be subsequent tests, demonstrations, and special training. The control of these items is a responsibility of the organization branch.

The remaining duties of the organization branch require no further comment. They are listed for convenient reference on Chart 2.

Troops Branch

The functions of the troops branch of the army group G-3 section consist of determination of requirements for combat troops, allocation of combat units to armies, control of movement of combat units into and between armies, and maintenance of complete assignment and attachment records on all combat units. These are very important duties and often affect a million or more men.

Requirements for Combat Troops

The army group commander in a theater of operations is assigned a mission by his superior commander, usually in the form of a letter of instructions. This mission should be given in clear and specific terms and should include the means to be given the army group commander, if these means have not already been allocated. Included in the means is a listing of the major units, such as corps or divisions, that will constitute the army group.

Based on the assigned mission of the army group, the staff prepares plans for the projected operations. These plans are based on the major units, such as corps and divisions, which have been, or will be allocated. As the plans are developed, troops requirements for the supporting units are prepared. When these plans make it desirable, requests are made to the higher commander for desired changes in either the major units or the supporting units.

The troops branch must work closely with the plans branch in determining these requirements, and the chiefs of the various

special staff sections are directed to make their appropriate recommendations as they pertain to the supporting units. It is the function of the troops branch to consolidate for the G-3 the requirements of the army group for combat units, while G-4 must consolidate the requirements for service units.

This determination of the troop requirements of the army group must be kept up-to-date as operations progress. It becomes a continuous study, particularly when the theater of operations has more than one army group and the varying missions assigned the respective army groups require a readjustment of the troops allocated in any one operation. The special staff sections are of great assistance to the troops branch in preparing these requirements. It is the responsibility of the troops branch to keep these staff sections abreast of developments in planning as the troop requirements are determined and consolidated.

Allocation of Combat Units to Armies

Once the troop list of the army group has been determined and announced by the higher commander, the army group commander must allocate the units placed at his disposal. Allocation of combat units must be made in accordance with an approved plan based on the tactical decision of the army group commander as to what missions are to be assigned the respective armies. In many instances, this proposed allocation may become the basis of the requirements for the army group, and the summation of the planned allocations may become the army group request on higher headquarters.

The troops branch becomes the agency of the G-3 section to consult with the various members of the general and special staff concerned and to coordinate the needs for the supporting combat units of the various armies. These staff recommendations are adjusted according to the needs of the armies and the availability of the troop units. Based on these studies the allocation of units is approved and the necessary changes between armies are made through the use of troop assignment orders. These orders indicate the change in status of the units, and the effective date of the indicated change, and are generally numbered consecutively throughout a calendar year. In some instances, the situation may be such as to warrant a change in assignment or attachment by oral orders, telephone, or teletype. But in every case, changes must be confirmed in the form of a written troop assignment order, so that this information may become a part of the permanent records of the units concerned.

Control of Movement of Combat Units

Usually, the allocation or transfer of units to armies will result in movements. The troops branch is concerned with and directs those movements which take place into and out of the army group, and movements between armies. The execution of those movements which are a concern of the army group headquarters requires coordination between the headquarters releasing the unit and the one receiving it. When the troops branch coordinates a movement, the procedure normally is as follows:

1. The troops branch issues to the unit concerned, such as a division or an artillery group, through command channels, a warning order of the impending move. This is done in order that preparation for the movement need not be delayed until receipt of the final details of the movement. This warning order usually includes only the tentative destination, tentative date of movement, and possibly security instructions, such as restrictions on the use of unit road markers. Arrangements are made with the proper agency for the necessary transportation required.

2. Final details are ascertained and the

troops branch issues the complete movement order. This movement order prescribes the date of movement, the destination, the agency to provide the transportation, complete security instructions, and where representatives of the unit will report to obtain traffic clearances. In exceptional cases, it may be necessary for the troops branch to prescribe a specific time for movement or a specific route for the movement because of restrictions imposed by the tactical situation. In such cases, this information is transmitted to the traffic branch of the G-4 section.

The movement order further directs that appropriate headquarters notify the troops branch of the time of departure and the time of arrival of the unit at its destination. Changes in assignment or attachment are normally effective upon the arrival of the unit at its destination. This is done in order that the headquarters releasing the unit may retain the responsibility for the completion of the movement. However, as mentioned above, the assignment or attachment is confirmed by the troop assignment order issued after the move has been completed. The function of the troops branch in these movements is one of control and coordination, the mechanics of the movement being carried out by the transportation and traffic agencies of the units or the headquarters involved in the movement.

Air Branch

While the G-3 Air at army is primarily interested in the formulation of the air-ground plan on a day-to-day basis, the G-3 Air at the army group has a relatively longer-range scope. More specifically, this consists of the integration of the air effort into plans affecting over-all operations at a future date, rather than those of immediate interest and limited scope. Therefore, the army group G-3 Air is interested primarily in counterair operations and air-to-ground attacks deep in enemy territory, rather than near the line of contact. His interest in third priority (close support) missions takes the form of coordinating with A-3 of the associated tactical air command as to allocation of effort of the tactical air forces (fighter). It may be desired that the effort of one tactical air force (fighter) be diverted from its associated army and employed in conjunction with another tactical air force (fighter) which is supporting an adjacent army. This diversion may be of a temporary nature or may involve the actual transfer of fighter elements. In instances when the aircraft of the tactical air force (bomber) are employed in close support, G-3 Air at army group headquarters must coordinate the plan with A-3 of the tactical air command.

Although the G-3 Air will work closely with A-3, tactical air command, it is visualized that a joint operations center or control center will not be necessary at the army group level due to the long-range nature of the air planning and operations. Daily joint briefings will undoubtedly be conducted, but the necessity for the joint operations center, as found at army, does not exist.

The relation of the tactical air command to the tactical air force (fighter) is one of supervision and issuance of broad directives. The tactical air command, however, normally retains full operational control of the tactical air force (bomber). This centralized control facilitates the employment of these forces anywhere on the army group front or deep into enemy territory. The employment of these Air Force units by the tactical air command is therefore of primary interest to the G-3 Air at army group headquarters.

The Organization of Logistics under the National Security Act of 1947

Colonel Ira K. Evans, *Quartermaster Corps*
Director, Department of Logistics

SUPPLIES and equipment totalling 48,000,000 tons were shipped to General Eisenhower during World War II. Yet, when a general officer in the combat zone asked his division G-4 to get him a pair of socks, all he could get was size 12, even though size 8 was what the general wanted. Actually, the right size was there all the time. Apparently, however, the knowledge of how to provide that particular size was not.

How did the socks arrive in the theater? They came by ship, as a result of the operation of a huge, intricate, and integrated logistical organization. At one time in the fall of 1944, more than 100 Liberty ships, filled with war materials, were at anchor off the northern coast of Europe because they could not be unloaded.

During World War II, when questioned as to why he was not filling overseas requisitions, the chief of one of the technical services replied that the theater had not requisitioned properly. He had more than 200,000 tons of maintenance supplies just waiting to fill requisitions. Upon investigation, it was found that the theater had 200,000 tons of the *same* maintenance items that it could not use. Incidentally, this was a direct result of automatic supply.

When called to task by President Roosevelt for not producing tanks faster, Mr. Knudson replied, "Mr. President, its like the laws of nature. It still takes 9 months." The organization that built the ships and manufactured the material that filled the ships was far from efficient.

Those who would defend our World War II logistical organization will state, "So what, we won the war, didn't we?" True, a tremendous job was done, but the over-all war effort was impaired by the lack of thorough and expeditious logistical support and by a waste of resources resulting from duplications of functions, facilities, personnel, and stocks. All this came about because complete and considered logistical planning had not been accomplished prior to the war.

The Meaning of Logistics

What do we mean by logistics?

Here are a few definitions:

Webster's Dictionary—"Logistics is that branch of military art which embraces the details of transport, quartering, and supply of troops."

Field Manual 100-10—"Logistics is that branch of administration which embraces the management and provision of supply, evacuation and hospitalization, transpor-

Since the problem of logistics affects not only the military services but the entire nation, the National Security Act of 1947 integrated it in a civilian-controlled agency, the National Security Resources Board

tation, and service. It envisages getting the right people and the appropriate supplies to the right place at the right time and in the proper conditions."

Dictionary of United States Army Terms—"Logistics—art of planning and carrying out military movement, evacuation, and supply."

Dictionary of United States Military Terms for Joint Usage—"That part of the entire military activity which deals with production, procurement, storage, transportation, distribution, maintenance, and evacuation of personnel, supplies, and equipment; with induction, classification assignment, welfare and separation of personnel; and with facilities required for the support of the military establishment including construction and operation thereof. It comprises both planning and implementation."

General LeRoy Lutes, Deputy Chairman of the Executive Committee, The Munitions Board—"Logistics embraces all military activities not included in the terms 'strategy' and 'tactics.' In this sense, logistics includes the procurement, storage, and distribution of equipment and supplies; the transport of troops and cargo by land, sea, and air; the construction and maintenance of facilities; communication by wire, radio, and the mails; the care of the sick and wounded; and the induction, classification, assignment, welfare, and separation of personnel."

In the above definitions, you will note considerable variation. This is because the term "logistics" has an increasingly broader meaning and application as we progress from the infantry division, through the various levels of our National Security organization, to the President.

An appreciation of the above is necessary for an understanding of logistics under the National Security Act of 1947. An analysis of the congressional hearings on this Act reveals that the dictionary for joint usage and the definition by General Lutes most nearly approximate the intent of Congress in prescribing our present organization for National Security.

Prior to World War II, the matter of acquiring men and materials for war was considered to be a purely military problem. The old Army and Navy Munitions Board prepared an industrial mobilization plan, but it was kept locked up. Very few civilians had seen it, yet these very same civilians were the ones who later were required to marshal the manpower and resources of our country and manage and direct our productive effort. The plan was good, but only those who could not do anything about it knew about it: i.e., the military. As a result, many of its fine provisions were not placed into effect until the latter part of the war.

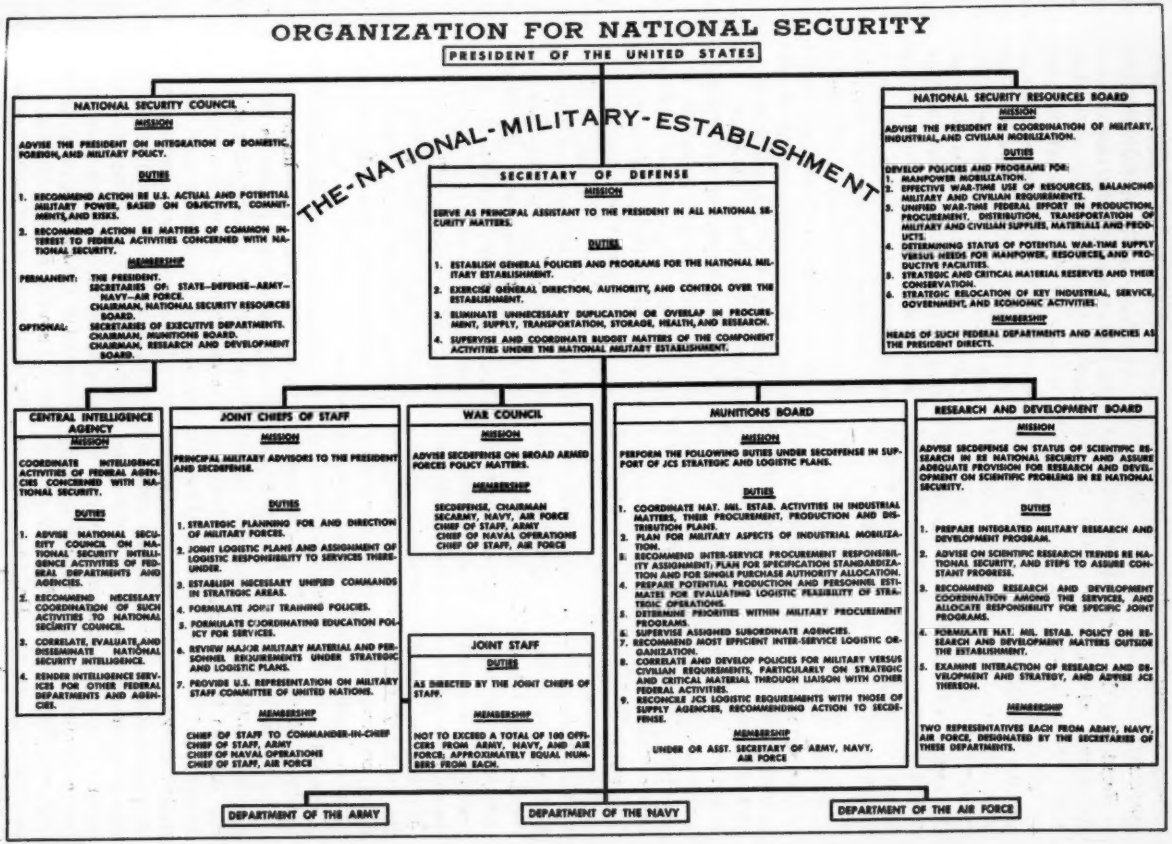
We will not have time to cover up our logistical mistakes in the next war.

Having learned our lesson from the last war, Congress, in enacting the National Security Act of 1947, followed the principle of providing an organization wherein those best qualified were given the responsibility in accordance with their qualifications (see chart).

Resources Board

The National Military Establishment was given the responsibility for purely military matters. The problem of logistics, however, since it not only affects the military but the nation as a whole, was integrated up through the military organization to a top civilian-controlled governmental agency, the National Security Resources Board.

Perhaps the logistical organization under this Act may appear to be complex, intricate, and with almost endless ramifications. It is a vast and complicated organization. However, there is nothing mysterious about it. To the extent permitted by political and service rivalries at the time of the passage of the Act, it


ORGANIZATION FOR NATIONAL SECURITY
PRESIDENT OF THE UNITED STATES
THE NATIONAL MILITARY ESTABLISHMENT
NATIONAL SECURITY COUNCIL
MISSION
ADVISE THE PRESIDENT ON INTEGRATION OF DOMESTIC, FOREIGN, AND MILITARY POLICY.
DUTIES
1. RECOMMEND ACTION RE U.S. ACTUAL AND POTENTIAL MILITARY POWER, BASED ON OBJECTIVES, COMMITMENTS, AND RISKS.
2. RECOMMEND ACTION RE MATTERS OF COMMON INTEREST TO FEDERAL ACTIVITIES CONCERNED WITH NATIONAL SECURITY.
MEMBERSHIP
PERMANENT: THE PRESIDENT.
SECRETARIES OF: STATE—DEFENSE—ARMY—NAVY—AIR FORCE.
CHAIRMAN, NATIONAL SECURITY RESOURCES BOARD.
OPTIONAL: SECRETARIES OF EXECUTIVE DEPARTMENTS.
CHAIRMAN, MUNITIONS BOARD.
CHAIRMAN, RESEARCH AND DEVELOPMENT BOARD.
SECRETARY OF DEFENSE
MISSION
SERVE AS PRINCIPAL ASSISTANT TO THE PRESIDENT IN ALL NATIONAL SECURITY MATTERS.
DUTIES
1. ESTABLISH GENERAL POLICIES AND PROGRAMS FOR THE NATIONAL MILITARY ESTABLISHMENT.
2. EXERCISE GENERAL DIRECTION, AUTHORITY, AND CONTROL OVER THE ESTABLISHMENT.
3. ELIMINATE UNNECESSARY DUPLICATION OR OVERLAP IN PROCUREMENT, SUPPLY, TRANSPORTATION, STORAGE, HEALTH, AND RESEARCH.
4. SUPERVISE AND COORDINATE BUDGET MATTERS OF THE COMPONENT ACTIVITIES UNDER THE NATIONAL MILITARY ESTABLISHMENT.
NATIONAL SECURITY RESOURCES BOARD
MISSION
ADVISE THE PRESIDENT RE COORDINATION OF MILITARY, INDUSTRIAL, AND CIVILIAN MOBILIZATION.
DUTIES
DEVELOP POLICIES AND PROGRAMS FOR:
1. MANPOWER MOBILIZATION.
2. EFFECTIVE WAR-TIME USE OF RESOURCES, BALANCING MILITARY AND CIVILIAN REQUIREMENTS.
3. UNIFIED WAR-TIME FEDERAL EFFORT IN PRODUCTION, PROCUREMENT, DISTRIBUTION, TRANSPORTATION OF MILITARY AND CIVILIAN SUPPLIES, MATERIALS AND PRODUCTS.
4. DETERMINING STATUS OF POTENTIAL WAR-TIME SUPPLY VERSUS NEEDS FOR MANPOWER, RESOURCES, AND PRODUCTIVE FACILITIES.
5. STRATEGIC AND CRITICAL MATERIAL RESERVES AND THEIR CONSERVATION.
6. STRATEGIC RELOCATION OF KEY INDUSTRIAL, SERVICE, GOVERNMENT, AND ECONOMIC ACTIVITIES.
MEMBERSHIP
HEADS OF SUCH FEDERAL DEPARTMENTS AND AGENCIES AS THE PRESIDENT DIRECTS.
CENTRAL INTELLIGENCE AGENCY
MISSION
COORDINATE INTELLIGENCE ACTIVITIES OF FEDERAL AGENCIES CONCERNED WITH NATIONAL SECURITY.
DUTIES
1. ADVISE NATIONAL SECURITY COUNCIL ON NATIONAL SECURITY INTELLIGENCE ACTIVITIES OF FEDERAL DEPARTMENTS AND AGENCIES.
2. RECOMMEND NECESSARY COORDINATION OF SUCH ACTIVITIES TO NATIONAL SECURITY COUNCIL.
3. CORRELATE, EVALUATE, AND DISSEMINATE NATIONAL SECURITY INTELLIGENCE.
4. RENDER INTELLIGENCE SERVICES FOR OTHER FEDERAL DEPARTMENTS AND AGENCIES.
JOINT CHIEFS OF STAFF
MISSION
PRINCIPAL MILITARY ADVISORS TO THE PRESIDENT AND SECDEFENSE.
DUTIES
1. STRATEGIC PLANNING FOR AND DIRECTION OF MILITARY FORCES.
2. JOINT LOGISTIC PLANS AND ASSIGNMENT OF LOGISTIC RESPONSIBILITY TO SERVICES THEREUNDER.
3. ESTABLISH NECESSARY UNIFIED COMMANDS IN STRATEGIC AREAS.
4. FORMULATE JOINT TRAINING POLICIES.
5. FORMULATE COORDINATING EDUCATION POLICY FOR SERVICES.
6. REVIEW MAJOR MILITARY MATERIAL AND PERSONNEL REQUIREMENTS UNDER STRATEGIC AND LOGISTIC PLANS.
7. PROVIDE U.S. REPRESENTATION ON MILITARY STAFF COMMITTEE OF UNITED NATIONS.
MEMBERSHIP
CHIEF OF STAFF TO COMMANDER-IN-CHIEF
CHIEF OF STAFF, ARMY
CHIEF OF NAVAL OPERATIONS
CHIEF OF STAFF, AIR FORCE
WAR COUNCIL
MISSION
ADVISE SECDEFENSE ON BROAD ARMED FORCES POLICY MATTERS.
MEMBERSHIP
SECDEFENSE, CHAIRMAN
SECARMY, NAVY, AIR FORCE
CHIEF OF STAFF, ARMY
CHIEF OF NAVAL OPERATIONS
CHIEF OF STAFF, AIR FORCE
JOINT STAFF
DUTIES
AS DIRECTED BY THE JOINT CHIEFS OF STAFF.
MEMBERSHIP
NOT TO EXCEED A TOTAL OF 100 OFFICERS FROM ARMY, NAVY, AND AIR FORCE; APPROXIMATELY EQUAL NUMBERS FROM EACH.
MUNITIONS BOARD
MISSION
PERFORM THE FOLLOWING DUTIES UNDER SECDEFENSE IN SUPPORT OF JCS STRATEGIC AND LOGISTIC PLANS.
DUTIES
1. COORDINATE NAT. MIL. ESTAB. ACTIVITIES IN INDUSTRIAL MATTERS, THEIR PROCUREMENT, PRODUCTION AND DISTRIBUTION PLANS.
2. PLAN FOR MILITARY ASPECTS OF INDUSTRIAL MOBILIZATION.
3. RECOMMEND INTER-SERVICE PROCUREMENT RESPONSIBILITY ASSIGNMENT; PLAN FOR SPECIFICATION STANDARDIZATION AND FOR SINGLE PURCHASE AUTHORITY ALLOCATION.
4. PREPARE POTENTIAL PRODUCTION AND PERSONNEL ESTIMATES FOR EVALUATING LOGISTIC FEASIBILITY OF STRATEGIC OPERATIONS.
5. DETERMINE PRIORITIES WITHIN MILITARY PROCUREMENT PROGRAMS.
6. SUPERVISE ASSIGNED SUBORDINATE AGENCIES.
7. RECOMMEND MOST EFFICIENT INTER-SERVICE LOGISTIC ORGANIZATION.
8. CORRELATE AND DEVELOP POLICIES FOR MILITARY VERSUS CIVILIAN REQUIREMENTS, PARTICULARLY ON STRATEGIC AND CRITICAL MATERIAL THROUGH LIAISON WITH OTHER FEDERAL ACTIVITIES.
9. RECONCILE JCS LOGISTIC REQUIREMENTS WITH THOSE OF SUPPLY AGENCIES, RECOMMENDING ACTION TO SECDEFENSE.
MEMBERSHIP
UNDER OR ASST. SECRETARY OF ARMY, NAVY, AIR FORCE
RESEARCH AND DEVELOPMENT BOARD
MISSION
ADVISE SECDEFENSE ON STATUS OF SCIENTIFIC RESEARCH IN RE NATIONAL SECURITY AND ASSURE ADEQUATE PROVISION FOR RESEARCH AND DEVELOPMENT ON SCIENTIFIC PROBLEMS IN RE NATIONAL SECURITY.
DUTIES
1. PREPARE INTEGRATED MILITARY RESEARCH AND DEVELOPMENT PROGRAM.
2. ADVISE ON SCIENTIFIC RESEARCH TRENDS RE NATIONAL SECURITY, AND STEPS TO ASSURE CONSTANT PROGRESS.
3. RECOMMEND RESEARCH AND DEVELOPMENT COORDINATION AMONG THE SERVICES, AND ALLOCATE RESPONSIBILITY FOR SPECIFIC JOINT PROGRAMS.
4. FORMULATE NAT. MIL. ESTAB. POLICY ON RESEARCH AND DEVELOPMENT MATTERS OUTSIDE THE ESTABLISHMENT.
5. EXAMINE INTERACTION OF RESEARCH AND DEVELOPMENT AND STRATEGY, AND ADVISE JCS THEREON.
MEMBERSHIP
TWO REPRESENTATIVES EACH FROM ARMY, NAVY, AIR FORCE, DESIGNATED BY THE SECRETARIES OF THESE DEPARTMENTS.
DEPARTMENT OF THE ARMY
DEPARTMENT OF THE NAVY
DEPARTMENT OF THE AIR FORCE

is based on sound principles of integrated organization.

World War II taught us that it takes the efforts of an entire nation to win wars. What is more logical, then, than to set up an organization to integrate, adjust, and balance the efforts of the military, the civilian, and the industrial forces? We must know the capabilities, the needs, and the limitations of each if they are to be accurately evaluated and judiciously applied toward the accomplishment of a common objective.

Logistical Fields

There are two distinct fields of logistical activities. One is the purely military or operational field type of activity required to support the military forces logistically. The other is the economic or industrial activity which is necessary to acquire the human and material resources that must be applied in the support of military operations.

This division of logistics into two fields was recognized in establishing the Organization for National Security (see chart). At the top level, the Secretary of Defense has primary responsibility for the military aspects of logistics, whereas the National Security Resources Board has primary responsibility for the national economic or industrial aspects of logistics. There is also a similar division of logistical functions between the Joint Chiefs of Staff and the Munitions Board.

The National Security Council is vitally concerned with logistics as adviser to the President on the integration of domestic, foreign, and military policies that are related to national security. The Council also assesses and appraises the national objectives, commitments, and risks in relation to our potential military power. The chairman of the National Security Resources Board and the Munitions Board are members of the National Security Council.

Mobilization of Resources

The basic problem facing the United States in preparing for any future major war is the mobilization of national resources. In the National Security Resources Board, we have the nucleus of an agency which must be capable of marshaling, organizing, controlling, directing, and managing our national economy. It is an agency capable of balancing our military, industrial, and civilian logistical requirements, in order to achieve victory and to leave our country in a healthy economic state at the end of the war.

The Board, as presently constituted, advises the President on the coordination of military, industrial, and civilian mobilization. It prepares programs for the effective use in time of war of the nation's natural, human, and industrial resources and for the maintenance and stabilization of the nation's economy and its adjustment to wartime needs.

The Board makes plans for the broad allocation of materials and manpower to claimant agencies, including the National Military Establishment. It engages in planning for all requirements and coordinates all planning for military, industrial, and civilian mobilization. Military requirements submitted to it by the Munitions Board are analyzed and correlated to the industrial feasibility of strategic plans.

In peacetime, the National Security Resources Board is not a large agency. Its total personnel approximates 250. This is because at the present time it utilizes to the maximum extent the services of many established government agencies such as the Department of Agriculture, Commerce, State, Treasury, Interior, Defense, and Labor, in its planning activities. The secretaries of these departments are members of the Board. Its peacetime organization is simple. For war purposes, however, it will require a tremendous expansion in personnel and authority. A functional

organization with directing authority is considered essential.

In our National Establishment, we have an integrated logistical agency. This agency is capable of determining our military requirements, of representing the requirements so that the military will receive manpower and the munitions of war necessary for success, and of utilizing the manpower and munitions in an expeditious manner.

Logistics in the NME

The Secretary of Defense has the overall responsibility for logistics in the National Military Establishment. Because of his small staff, however, he has delegated his authority to discharge those responsibilities (exclusive of the War Council's responsibility on broad policy matters and the Research and Development Board's responsibility for the military implications of scientific research) to two primary and three secondary agencies. That is, field or operational logistics are the responsibility of the Joint Chiefs of Staff, while economic or industrial logistics is the responsibility of the Munitions Board.

In turn, the Department of the Army, the Department of the Navy, and the Department of the Air Force, the secondary agencies, are responsible for implementing the logistical directives of the two top logistical agencies in the National Military Establishment (the Joint Chiefs of Staff and the Munitions Board). In addition, the service departments make available to these top agencies the basic data upon which over-all National Military Establishment logistical plans, policies, and procedures can be determined and promulgated. This delineation of logistical responsibility requires a high degree of coordination, correlation, concurrent effort, and mutual respect and confidence between the logistical agencies of the National Military Establishment.

In order to carry out their logistical responsibilities, the Joint Chiefs of Staff have a Joint Logistics Plans Committee and a Joint Logistics Plans Group, the latter being part of the Joint Staff. You will note from the chart that the logistical functions of the Joint Chiefs of Staff consist primarily of the preparation of plans covering the purely military aspects of logistical matters. They also include the furnishing of guidance or data on such strategic and mobilization plans to the Munitions Board. This permits the implementation of these plans by the Board through its preparation of logistical plans and programs covering the necessary economic and industrial support. The three military services prepare their *own* logistical plans and programs to support logistically the military strategic and mobilization plans.

Munitions Board

The Munitions Board is composed of seven divisions that deal with procurement, facilities, manpower, utilities, military requirements, foreign trade, and surveys. The last mentioned division is a management organization that coordinates and analyzes surveys of logistical activities and maintains a general review of logistic plans and procedures, particularly with a view to the elimination of unnecessary duplications or the installation of improvements designed to promote efficiency or economy. To date, these surveys have resulted in joint procurement regulations. Thorough studies are now under way of all military installations and activities in order to bring out the maximum common use of facilities and services. In this connection, working procedures have been developed and a list prepared of logistical activities that are considered susceptible of joint, single, or cross operation. A critical comparison and analysis is being made of the supply systems of the Army, Navy, and Air Force with a view to

coordinating and integrating the supply systems of the National Military Establishment.

Strategic and mobilization plans prepared by the Joint Chiefs of Staff are furnished the Munitions Board. Upon receiving these plans, the Munitions Board supervises the Army, Navy, and Air Force in working out such details as numbers of men, ships, planes, guns, tanks, and other supplies and equipment that are necessary to support and carry out these plans. These requirements are adjusted to reflect other military requirements and are then translated by the Board in requirements for raw materials, fuel and power, tools and equipment, components and subassemblies, and manpower. At this point, the Munitions Board, in collaboration with the National Security Resources Board, determines the logistical (economic and industrial) feasibility of the plan. It is significant that this procedure provides a check on theoretical or one-sided planning by the application of practical and potential logistical facts.

Implementation

The Departments of the Army, Navy, and Air Force, the three secondary agencies, are the logistical work horses of the National Military Establishment. They implement the logistical policy, guidance, and direction of the Joint Chiefs of Staff and the Munitions Board by the preparation of detailed plans, programs, and procedures. In addition, they take action to effect their approved plans, programs, and procedures at the appropriate time or at the direction of the Joint Chiefs of Staff and the Munitions Board. They are responsible for carrying out both operational logistics and the military aspects of economic and industrial logistics.

The logistical organizations of the three departments (including the Air Force) are the results of many years of study and analysis by the individual departments. From the point of view of an integrated logistical organization, no two are alike. This is understandable, since each has a different medium of activity, i.e., ground, sea, and air. The Navy has its Bureaus, the Army, its Technical and Administrative Services, and the Air Force, the Matériel Command. Fundamentally, however, their concepts of logistical responsibility, logistical command, and administration, are the same. Their differences lie in the details of their organization and their detailed procedures and methods for carrying out their logistical responsibilities. At this level, personnel matters are handled by separate agencies in all three departments. Thus, at this level, the field of logistics has been arbitrarily narrowed by the exclusion of personnel administration.

Importance of Logistics

Logistics played a vital part in the winning of World War II and will play an increasingly important part in any future major war as we progress farther and farther away from wars of hand-to-hand combat toward wars of machines.

Regardless of the military job a soldier may hold in a future war, logistical factors will influence the manner in which he performs his job. It behooves every officer of the armed forces to have a working knowledge of the logistical organization which, in the final analysis, makes combat possible.

Logistics and combat are inseparable.

The logistical organization under the National Security Act of 1947 is not perfect. Many necessary actions are still in the planning stage; many have just been initiated; many have been taken which must be discarded, revised, or changed; and many actions have been taken which already have proved to be unsound.

In the final analysis, a tremendous amount of work remains. Logistical organization and planning is never complete.

PERSONNEL DISTRIBUTION
A Major Wartime Problem

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Introduction

DISTRIBUTION of the required numbers of personnel, at the proper time and place, and in accordance with their most proficient skills and abilities, has been one of the most difficult problems to solve in past wars. The discussion that follows illustrates how the procedures developed and used in World War II can be improved to better accomplish the distribution of personnel in a future mobilization.

Definition of Terms

The personnel requirements for the Army can be broken down into the following categories:

1. Cadre—A group of individuals intended to occupy key positions in an organization.

2. Fillers—Individuals available for assignment to fill vacancies not previously occupied.

3. Replacements—Trained individuals available for assignment to fill vacancies created by losses.

The Personnel "Pipeline"

The system as developed during World War II for meeting personnel needs was based upon personnel reservoirs and distribution "pipelines."

Pipeline personnel are those individuals who are not included in a table of organization or bulk authorization unit. They are personnel who are in the process of reception, assignment, training, and separation. The pipeline agencies are those installations which carry out the above. They include induction stations, reception centers, training centers, schools, replacement depots, ports of embarkation, reception stations, and separation centers. These various pipeline agencies all performed specific missions. In general, they acted as the valves or control points within the distribution system.

Distribution Systems

There was no planned distribution system prior to World War II. As many units as were considered feasible were organized and reorganized. When units were reduced to ineffective size, they were withdrawn from combat and reorganized. The personnel for the reorganization was "cannibalized" from other units which were subsequently disbanded or inactivated. This system created tremendous morale problems, necessitated retraining of entire units, made units inactive over extended periods of time, and placed a heavy burden on service troops for supplies, maintenance, and rehabilitation.

One of the major problems of war in the past has been to distribute personnel in the required numbers, at the right time and place, and with the desired skills. The solution lies in proper administration

The pipeline distribution system as developed during World War II was not perfect but it eliminated many disadvantages. It was capable of providing a constant flow of personnel from civil life to the units as they were needed. Training of the individual, prior to his joining a unit, required less time. It permitted more orderly withdrawal of manpower from industry and prompt diversion of the manpower withdrawn to the place where they were most needed.

It utilized to the maximum the *esprit* built up in a "going" unit and maintained these units in an active status.* It reduced to a minimum the numbers of individuals not actively employed. Lastly, it utilized shipping to the maximum.

World War II Distribution System

To capitalize on these advantages, a pipeline distribution system was adopted for World War II. This personnel distribution system had as its objective the orderly movement of individuals from the time they come under the Army's jurisdiction until they are assigned to an operation-type unit. This orderly movement requires that thousands of individuals pass through various processing and training installations in accordance with a master plan designed to furnish the needs of the Army's phased troop basis. The distribution system, then, must not be limited only to the physical movement of individuals, but must encompass the herculean task of supplying individuals to the many and varied using units throughout the Army at the required time, in the proper numbers, and with the required military qualifications.

The Problems Encountered

The accomplishment of the personnel distribution system's objective was complicated by the following conditions:

1. The lack of centralized control. There was no single individual agency of the War Department General Staff charged with this responsibility. It was divided between the assistant Chiefs of Staff, G-1, G-3, and the Operations Division of the War Department General Staff. As a result, personnel operations were almost completely decentralized and centralized control was limited and loosely coordinated. This condition adversely affected the administration and operations of the distribution system.

2. The absence of integrated planning. No organizational structure was created to operate the distribution system during the early stages of mobilization. Eventually, a system was developed by the process of trial and error and the responsibility for its operations delegated to the Army Service Forces—one of the chief competitors for manpower.

3. The inability to allocate personnel according to the qualitative needs of the Air, Ground, and Service Forces on the basis of factual data. The different types of jobs in the Army had not been analyzed to determine the mental and physical capacities necessary for the efficient performance of each type. In view of the lack of such supporting data and the necessity for immediate expansion, the Army Air Force was given preferential treatment in manpower quality over the Ground Forces, based upon the claim that jobs in the Air Forces are technical in nature and require above-average mental and physical abilities.*

4. An inadequate system of classifica-

* Manpower was wasted due to the lack of a planned rotation system to provide relief for combat units. This condition cannot be charged against the distribution system.

* A directive from the War Department was issued on 2 February 1942, stating that "75 percent of all white inductees assigned to the Army Air Force from reception centers would have an AGCT score of 100 or better." This ruling was suspended on 18 July 1942. On 7 September 1942, this preference was reinstated and expanded to include those men who scored 100 on both the AGCT and the mechanical aptitude test. This gave the Air Forces three-fourths of the top third of the nation's military manpower during the critical building phase. This policy remained in effect until 1 June 1943, when mobilization had been virtually completed.

tion which placed primary emphasis on acquired civilian skills as a means of classifying individuals entering the Army. This placed the combat ground forces, particularly the infantry, at a disadvantage, because few jobs in the ground combat arms have any relation to civilian-type jobs. Those individuals with acquired civilian skills generally fall into the upper third of the manpower pool.

5. The failure to establish early a uniform worldwide accounting system which would provide information essential to proper manpower balance.

The above problems have since been viewed in their proper perspective. Considerable research and study has been directed toward developing new procedures or improving upon those already developed.

The improvements in the Army's classification system can be cited as an example. A job analysis is currently being made of all the tables of organization positions in the Army, both officer and enlisted. When this problem is completed, the Army should know the minimum mental and physical qualifications required to perform every job within the Army. Other refinements include the use of the physical profile system, the development of more valid and reliable aptitudes tests, increased emphasis on interest areas as an aid to classification, and the refinement of interviewing techniques. Thus, the Army is now better able to match individual qualifications against analyzed job requirements and proportion the manpower quality accordingly.

Effects of Classification on Distribution

The improvements in the Army's classification system should increase the effectiveness of the distribution system, because efficient distribution depends on proper classification. The classification system determines, as objectively as possible, the individual's qualifications and classifies these qualifications in terms of a military occupational specialty (MOS). An MOS is a title applying to a group of related military duties and responsibilities normally requiring special knowledge and skills. Each individual coming into the Army is classified in terms of his acquired and potential abilities, both mentally and physically. If the individual has acquired civilian skills which are in critical demand by the Army, he is earmarked for the type of job which will utilize those skills by assigning a tentative MOS. If he possesses no outstanding skills, he is initially classified in terms of mental and physical capacities.

Currently there are 12 combinations of the physical and mental groupings, the highest being A-I and the lowest C-IV. Physical capacities are expressed alphabetically—A, B, and C—according to the PULHES system. Mental capacities are expressed in Roman numerals—I, II, III, and IV—according to scores attained in general classification tests. The composite classification consisting of the MOS and the mental-physical grouping is the basis upon which the distribution system supplies military personnel to units and installations throughout the Army.

Planning a Distribution System

Experience in World War II demonstrated the necessity for developing a distribution system with certain well-defined characteristics.

The first requisite is, manifestly, conformance to the mobilization training plan. The mobilization training plan prescribes the general scheme to be followed. It establishes the type of training installations to be established and the nature, scope, and duration of the training to be conducted by various types of units. Based upon this plan, the general direction of flow for pipeline personnel can be determined.

The distribution system must be capable of centralized control and decentralized operation. This concept requires that one headquarters control the flow of personnel, both quantitatively and qualitatively, to all units and installations with a minimum of administrative operations on its part. The operations are performed by subordinate field agencies. It is virtually an administrative impossibility for one headquarters, during a rapid expansion, to match the qualifications of all individuals against the many and varied job requirements in the Army as called for in the troop basis.

During World War II, control fluctuated from one extreme to the other. During the latter stages of the war, the War Department exercised centralized control over the entire distribution system by directing the flow out of installations to units based upon detailed availability reports submitted daily by each pipeline supply agency. These reports listed individuals by type and quantity, available for daily assignment. The War Department balanced the requirements against the availabilities and directed assignment accordingly. Individual assignment was directed by type and quantity. This administrative procedure required a large overhead to operate and lacked flexibility.

Lastly, the distribution system should make provisions for exploiting the sources of supply. Exploitation can be accomplished by dispersing the requirements of untrained personnel between numerous supply agencies, taking into consideration the qualitative experience factors from different sections of the country. For example, there will be a greater proportion of machinists and mechanics from the manpower obtained in the Detroit area than from a like number obtained in other sections of the country. Maximum exploitation is also achieved by coordinating the production rates of the pipeline installations with the activation rates for units and by providing reservoirs for unforeseen variations in these rates.

TYPE TRAINING	INSTALLATIONS OR UNITS					TIME	
	Basic Training Center	Replacement Training Center	Schools	Divisions	Non-Divisional Units	Minimum Weeks	Optimum Weeks
Basic Military [1]	X			X		8	8
Branch Specialists [2]		X		X		5	9
Unit and Combined [3]				X	X	15	17
Field Exercises and Maneuvers [4]				X	X	8	8
Advanced Specialists [5]			X			2-34	2-34
Refresher [6]		X	X			2-4	2-4

[1] Basic training is fundamental, individual training that is common to all branches of the service.
[2] Branch specialist training is individual training that is common to a particular branch of the service.
[3] Unit and combined training is prescribed to train individuals as a unit and to operate in conjunction with other branches and arms of the service.
[4] Field exercises and maneuvers are prescribed to perfect unit and combined training under simulated combat conditions.
[5] Advanced specialists training is prescribed to qualify the individual in technical and administrative jobs required by the arms and services.
[6] Refresher training is prescribed for an individual who has been trained as a result of previous military service.

CHART 1.

Proposed Filler Plan

For purposes of illustrating how these desired characteristics should function in a distribution system that is geared to the task of supplying fillers to new and expanded units during mobilization, let us consider the following hypothetical situation.

Situation: A state of national emergency has been declared and mobilization plans are ordered executed. Selective Service has been expanded to procure the manpower requirements of the National Military Establishment. The mobilization and deployment schedule calls for certain units of the Army of the United States to be expanded or activated according to mobilization periods (months).

The mobilization training plan prescribes that training for the first six periods (months) of the mobilization will be accomplished according to the plan in Chart 1.

For the distribution plan to conform with the training plan, it will be necessary to establish the pipeline processing and training installations as listed in Chart 2, with missions as indicated.

Direction and Extent of Flow

After the classification and training plans are established, it is necessary to determine the direction and extent of flow for personnel through the distribution pipeline which will be in accord with the training plan. To do this requires that the manpower entering the Army and in the training segment of the pipeline be grouped under the following four broad categories based upon such considerations as military skills, physical potential, and previously acquired technical skills of particular value to the army.

1. *Group 1* consists of untrained individuals, without prior military service, who have acquired civilian skills that have a counterpart in the highly skilled and technical specialist jobs needed by the Army, as listed in the "critical specialist list." The above individuals should be assigned a *tentative MOS* at

TYPE INSTALLATION	MISSION
Induction Stations	Determine the acceptability of Selective Service registrants for service in the Armed Forces; apportion acceptable personnel among the Army, Navy, and Air Forces and "swear in" or induct those allocated to the Army.
Reception Centers	Equip, test, classify, and transfer all individuals entering the Army to training installations or units.
Basic Training Centers	Conduct fundamental individual training common to all branches. Orient new soldiers in military life and further classify them for more accurate assignment on graduation.
Replacement Training Centers	Train and classify soldiers in common occupational specialties peculiar to an arm or service.
Schools	Train individuals for specialties which cannot be accomplished at the replacement training centers in the time allowed for common specialist training.
Replacement Depots	Process and screen replacements prior to shipment to a theater or overseas command.
Ports of Embarkation	Provide and operate facilities for the expeditious handling of personnel going to or coming from destinations outside the continental United States.

CHART 2.

reception centers and earmarked for specialist training.

2. *Group 2* includes the remainder of untrained individuals without prior military service. Upon entry into the Army, these individuals should be classified according to mental-physical capacities similar to the 12 basic groupings from A-I to C-IV in current use.

3. *Group 3* includes individuals who received training as a result of previous military service. These individuals should be assigned a *tentative MOS* at the reception center, given refresher training at a replacement training center or service school, and then assigned an MOS in which they are qualified.

4. *Group 4* consists of individuals who are trained in the pipeline training installations and are qualified in an MOS. This requires completion of training as a branch specialist at a replacement training center, as a basically trained soldier at a basic training center, or as an advanced specialist at a service school.

From the training plan and the categories of individuals in the manpower pool, it is now possible to construct the pipelines to the agencies which make up the distribution system.

Individuals falling in Group 1 are sent to basic training centers for individual basic military training. From basic training centers, they are sent to the appropriate school and trained as advanced specialists. Upon completion of school training, they are assigned an MOS and are available for assignment to meet a specific job requirement.

Individuals in Group 2 are transferred to divisions and basic training centers for training. Those transferred to divisions are assigned to units and receive training as prescribed in the training plan. Individuals transferred to the basic training centers are awarded a basic MOS upon completion of this training and are then transferred to replacement training centers for individual branch training.

Individuals in Group 3 are transferred to replacement training centers and schools for refresher training. Upon completion of this training, they are given an MOS in which they have become qualified.

Individuals in Group 4 are those completing training at basic training centers, replacement training centers, and schools. They are transferred from basic training centers to replacement training centers and schools, and from the latter two installations to units and replacement depots.

The direction and extent of flow through the pipeline agencies is shown graphically in Chart 3.

How the System Operates

The pipeline is thus established in accordance with the mobilization training plan. As stated previously, centralized control and decentralized operation are prerequisites of the control plan.

The problem now is to initiate procedures by which the Department of the Army can maintain centralized control over the flow through the distribution system without becoming submerged in a maze of administrative detail. Consider each of the four categories of personnel in the military manpower pool, as illustrated in Chart 3. The system might be controlled as follows:

Group 1. The Department of the Army, knowing the number required, can maintain centralized control over the distribution of this category of personnel by periodically issuing to the reception centers "critical specialist lists" and prescribing quotas to each reception center. These quotas would be based upon experience factors (occurrence rates), according to geographical portions of the country. The reception center can select, based upon the classification accomplished at the reception center, those individuals who possess the desired civilian skills to

fulfill the Army's specialist requirements from the flow entering the reception center. By reference to the flow chart, Chart 3, the distribution is simple. Reception centers would ship this category of personnel automatically to basic training centers. Upon completion of basic training, this category would be shipped automatically to the service schools. From an availability report submitted weekly by the service schools, the Department of the Army would know several weeks in advance the number and type of graduates and when they would become available for assignment. Distribution could be directed accordingly.

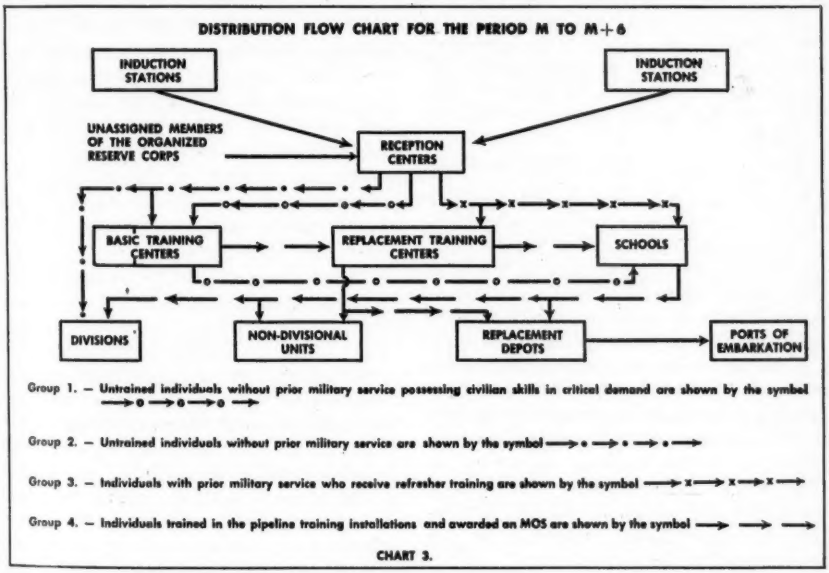

DISTRIBUTION FLOW CHART FOR THE PERIOD M TO M+6
INDUCTION STATIONS
INDUCTION STATIONS
UNASSIGNED MEMBERS OF THE ORGANIZED RESERVE CORPS
RECEPTION CENTERS
BASIC TRAINING CENTERS
REPLACEMENT TRAINING CENTERS
SCHOOLS
DIVISIONS
NON-DIVISIONAL UNITS
REPLACEMENT DEPOTS
PORTS OF EMBARKATION
Group 1. — Untrained individuals without prior military service possessing civilian skills in critical demand are shown by the symbol
Group 2. — Untrained individuals without prior military service are shown by the symbol
Group 3. — Individuals with prior military service who receive refresher training are shown by the symbol
Group 4. — Individuals trained in the pipeline training installations and awarded an MOS are shown by the symbol

CHART 3.

Group 2. The flow of this category is relatively simple, as indicated in Chart 3, being from reception centers to either basic training centers or divisions. Consequently, the distribution problem centers around operations at the reception centers. To fulfill the concepts of centralized control and decentralized operation of this category, Department of the Army should merely direct the reception centers to ship a stated number of individuals to specific divisions and basic training centers. Reception centers should select the number for each shipment in a manner which will ensure an equitable *qualitative* distribution to meet job requirements as indicated by the job-analysis survey. This can be done for divisions by providing each reception center with physical-mental rate tables for each type of division. For example, let us assume that a reception center has received a TWX from the Department of the Army stating, "Ship 1,000 fillers to the 10th Infantry Division, Camp Jackson, S. C., to arrive not later than 1800, 6 June. Direct communications for schedules of arrival authorized." The reception center would then consult the appropriate mental-physical rate table and ship (after co-

ordinating the arrivals with the 10th Infantry Division) the required personnel by types appropriate to the tables of organization of an infantry division. If the reception center is unable to meet the requirements of the mental-physical rate table, it notifies Department of the Army of short shipment. Calls are then placed on other reception centers to furnish shortages. Once a week, the pipeline supply agencies submit to the Department of the Army a status report; this indicates personnel processed each week and the numbers on hand. This procedure eliminates a mass of unnecessary administration and permits greater flexibility to the supply agency in meeting requirements.

Group 3. The distribution of this category also centers around the reception center. Centralized control can be maintained in the Department of the Army by issuing standing instructions to the effect that these individuals will be shipped automatically in accordance with the flow plan to the appropriate replacement training center or school for refresher training. No special reports are necessary because these individuals will be included in the weekly availability report which is submitted by the training agency to the Department of the Army. Decentralized operations are accomplished by carrying out the instructions prescribed by the Department of the Army.

Group 4. The distribution of this category of personnel centers around the replacement training centers and service schools. The Department of the Army will know the Army-wide requirements. To fulfill the concept of centralized control and decentralized operation, the Department of the Army would merely direct the pipeline training installations to ship a stated number of individuals to a specific unit. For each type unit, an MOS occurrence rate table can be constructed which would indicate the MOS's required. The replacement training centers and schools can apply this MOS occurrence rate table to the shipping directive received from the Department of the Army and then ship the type of personnel required.

Exploitation of the Source of Supply

The final prerequisite of a distribution plan is maximum exploitation of the sources of supply. In the proposed plan, maximum exploitation can be affected by:

First, dispersing the requirements of untrained personnel among numerous supply agencies, taking into consideration the qualitative experience factors from different sections of the country.

Secondly, achieving the maximum coordination between the production rates, quantitatively and qualitatively, and the activation rates for units.

Thirdly, providing for reservoirs for unforeseen variations between these rates.

Summary

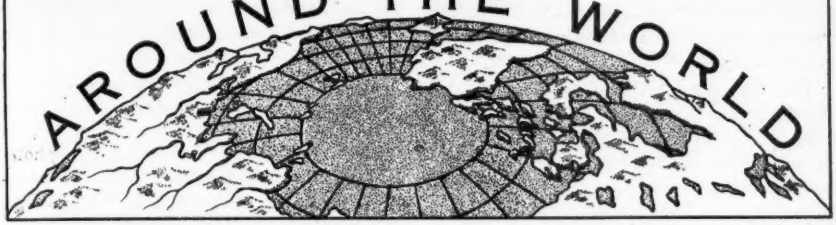
Admittedly, the proposed plan for distribution of filler personnel to new and expanded units of the troop basis is outlined in only its broadest aspects. The detailed procedures could be worked out in the form of a CPX or map maneuver as currently conducted in some service schools.

The proposed plan covers only the mobilization phase, a period of relatively stable requirements. But with modifications, it could be equally adapted to supply loss replacements.

The advantages of the proposed plan are believed to be:

1. Simplicity of operation.
2. Reduced operation overhead.
3. Greater flexibility to pipeline supply agencies in meeting requirements.
4. Better distribution of manpower quality.

MILITARY NOTES AROUND THE WORLD



UNITED STATES

Submarine Devices

Vital instruments to increase submarine effectiveness are being developed by the United States Navy at its Underground Sound Laboratory at New London, Conn.

Among the devices that the laboratory has put into production is a telephone for voice communication through water. This device has wide practical possibilities, but one of its more obvious uses is communication between a submarine in distress and a searching party.

During World War II, the laboratory perfected the expendable sonobuoy, a sound detector and radio transmitter that could be dropped from a search plane by parachute and from which signals of the presence of enemy submarines were then sent automatically.

The laboratory also has done considerable work in the development of air-sea rescue systems. One of these devices, which has practical peacetime applications, is called SOFAR, meaning sound fixing and ranging. By means of detecting and recording apparatus at shore stations, SOFAR permits the detection and location of an underwater explosive charge set off as far as 3,000 miles away. Thus, a plane flying over an ocean may signal its distress by dropping a small depth charge and may be rescued by craft summoned by radio.—*The New York Times.*

Signal Corps Research

Recent developments in the Signal Corps' research and development program include modification of the famous Handie-Talkie radio by adding a homing device whereby an individual may orient himself with reference to a radio transmitter which has a characteristic signal.

Other developments include the following:

Ultra-sonic sound waves, capable of exterminating mice and small insects.

A 2½-ton communications truck, from which telephone and typed messages may be sent distances greater than 1,000 miles.

Synthetic mica, with the desirable characteristics of natural mica, for use in electronic equipment. The United States has been importing supplies of natural mica.

A lightweight telephone exchange, adaptable to freezing or tropical temperatures, capable of providing switching facilities for 2,000 lines and requiring only 24 hours to install.

Modification of wartime radioteletype equipment to produce a complete mobile radioteletype station and signal center. This equipment is capable of duplex radioteletype operation up to 50,000 words per day under combat-load conditions.—*Report to the Army.*

New Navy Helicopter

All-metal rotor blades are a feature of a new Navy helicopter. Nylon replaces metal in its fuel tanks, and a hatch in the floor permits the use of the craft in aerial photography.

The experimental helicopter, built by the Sikorsky Division of United Aircraft Corporation, is known as the XHJS-1. It has a maximum capacity of five persons, including the crew. It is specially designed for utility, rescue, and observation work with aircraft carriers, battleships, and cruisers.

Navy XHJS-1.—US Navy photo.

The XHJS-1 is a one-engine machine and has a tail construction that makes it resemble the conventional airplane more than other helicopters. Its tail rotor has been attached to an arm projecting upward at an angle from the tip of the tail cone. This raises the revolving blades above head level, making it safer for shipboard personnel, and preventing the blades from striking the deck in landing in a heavy sea.—*Science News Letter.*

Mapping and Charting

The Secretary of Defense has announced approval of a plan for coordination of mapping and charting activities and related photographic work in the National Military Establishment.

Under the plan, a Photographic and Survey Section of the Joint Intelligence Group, Joint Staff, will coordinate photography, geodesy, hydrography, photogrammetry, cartography, topography, mapping, charting, surveying, terrain models, photo interpretation, compilation, reproduction, and allied intelligence functions.

Heretofore, the Army, Navy, and Air Force have conducted independent photographic and mapping activities. The Joint Intelligence Committee, composed of the intelligence chiefs of the three services and the Joint Staff's deputy director for intelligence, has utilized information received from the departments.

The Photographic and Survey Section now can forward its decisions to appropriate NME agencies without reference to the Joint Intelligence Committee, except on matters of major policy, and can communicate directly with civilian and nonmilitary governmental agencies.

Under the authority granted by the Secretary of Defense, the Photographic and Survey Section will formulate requirements, prepare plans of joint interest covering the production and distribution of maps and charts required for military operations and training, and establish project priorities. It will maintain plans and protect priorities on a current basis, revise plans and priorities in keeping with new developments, and provide guidance on operating schedules.

The Photographic and Survey Section will be composed of a commissioned representative from each military service and of civilian assistants designated by the Director of the Joint Staff. A topographic engineer is among the latter.—National Military Establishment.

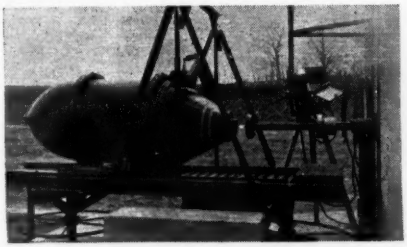
Army Uses Television

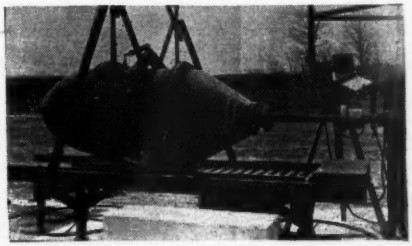
Television has been given its first industrial job by the Army Ordnance Department, which is using special equipment in ammunition storage areas to keep close tab on dangerous operations.

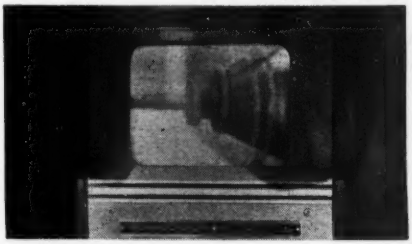
Since 1942, heavy concrete barricades have been prescribed for the protection of personnel in all ammunition disassembly areas. The operators work behind these barricades, manipulating various tools by remote control to disassemble the ordnance missiles. To enable the engineers to watch this manipulation, early experiments were made with mirrors. These proved unsatisfactory because the mirrored images of the explosive items were not clear to personnel stationed at safe distances behind the barricade.

In 1943, an attempt was made to obtain a television device which would transmit by cable to a safe distance a close-up view of the disassembly operations. This search led to the selection of the Remington Rand Vericon Television System, which transmits its impulses over a coaxial cable. The camera, receiver, and power unit are portable and require no expert technicians to handle them. Of particular importance to the Army is the fact that the equipment is relatively inexpensive.

It is possible for a single camera to transmit identical images to as many as 10 different viewers. The generator can be located 100 feet from the camera. A viewer may be as much as a mile away from the master viewer, which can be set up as far as 1,000 feet from the camera.—National Military Establishment.







These pictures show how television is used in dangerous Ordnance operations. Above, left, a television camera and bomb prior to defusing; above, right, attaching the remote control wrench. Below, left, closeup of camera aimed at the coupling of the wrench and the bomb; below, right, the operation as seen on the screen.—US Army photos.

Standardized Equipment

Development of a common catalog system and standardized equipment for the armed services has been started. Orders have been issued establishing the Munitions Board cataloging agency and the Munitions Board standards agency.

The task of the cataloging agency is to coordinate the efforts of the Army, Navy, and Air Force in preparing a uniform catalog of all items used by the National Military Establishment in peace and war. Each item will be provided a single name, description, and identification number, and will be classified in but one supply commodity class.

The function of the standards agency is to develop unified agreement on National Military Establishment specification and engineering standards and to develop agreements among the Army, Navy, and Air Force on standard designs of equipment and component parts.—*Ordnance.*

Joint Postal Service

The Army and the Air Force have announced the creation of a joint Army-Air Force Postal Service which places under a single authority responsibility for military postal and security courier services. It does not affect civilian-military postal arrangements.

In announcing the joint policy, the Army and Air Force gave formal recognition to an interdepartmental service which has been functioning since the Air Force became a separate department under the Armed Forces Unification Act.

The military postal service during the war was a War Department function.

To plan the development, integration, and policies of the Army-Air Force Postal Service, a joint Postal Policy Board will be established. The board will consist of an equal number of officers of each service. —Departments of the Army and Air Force.

Tracking Missiles

As rockets fly higher and higher, it gets harder and harder to keep track of them. Telescopes have followed V-2s to about 100 miles up. But the slender WAC corporal, which rose 250 miles above White Sands, New Mexico, was too much for a telescope or radar. What kept track of it was DOVAP (DOppler Velocity And Position), a new instrument designed for rocket-tracking by the Army's Ballistic Research Laboratories at Aberdeen Proving Ground, Maryland.

A missile to be tracked by DOVAP carries a small radio transceiver (transmitter and receiver) which receives a radio wave from the ground, doubles its frequency, and relays it back to earth. But when the doubled wave is received on the ground, it is not exactly doubled. A body moving toward a receiver "crowds" the waves together, shortens them, and thus increases their frequency. Moving away, it "pulls out" the waves, reducing their frequency. This is called "Doppler effect." Because of the "Doppler effect," the frequency of the wave received on the ground is changed slightly in proportion to the speed of the missile. This variation, recorded as a sinuous line on a strip of movie film, measures how fast the missile is moving away from the receiving station.

DOVAP's ground set has a loudspeaker which blares out the Doppler wave. As the rocket rises into the air and disappears from sight, the whistle of the missile tells listeners how it is doing. The sound gets shriller and shriller as the rocket gains speed. Then the pitch begins to fall as the rocket, its fuel exhausted, begins to slow down. The sound dies to a deep bass. Then comes silence as the rocket reaches the top of its flight. The sound starts again as the rocket begins falling. It rises to a piercing shriek and ends in sudden silence as the rocket hits the earth.—News report.

Newest Jet Fighter

The Republic XF-91, a new Air Force interceptor fighter, has been undergoing test flights recently.—US Air Force photo.

The Republic XF-91 is designed as an interceptor fighter to be used as a local defense weapon capable of combatting enemy bombers and such missiles that come within its range and capabilities.

Powered by a turbo-jet engine, the interceptor incorporates rocket motors for accelerated takeoff and climb and for operations at high altitude.

The XF-91's thin wings are swept back and have the appearance of being wider at the wing tips than at the wing and fuselage junction. The horizontal and vertical tail surfaces of the plane are also swept back.

The wing span of the aircraft is approximately 30 feet and its length over 45 feet. The landing gear consists of two wheels in tandem under each wing and a conventional nose gear. The XF-91 is equipped with a pilot ejection seat, cabin pressurization, and refrigeration for the pilot at high speeds.—Department of the Air Force.

New Wind Tunnel

A wind tunnel capable of simulating speeds of 1,700 mph is being completed at the Langley laboratory for study of supersonic aircraft designs.

The new tunnel will have a rated speed 2.2 times the speed of sound. Because air moving through the tunnel at that speed will heat up to 250°, a refrigerating unit has been installed just ahead of the test section (where the models are placed) to cool the air to about 100°.—*The New York Times*.

Scientific Organization

The US Air Force announced recently the establishment of a nonprofit organization to study, on a broad scientific basis, methods of improving national security.

The organization, known as the RAND (Research and Development) Corporation, represents a new phase of the Air Force program to use the country's top-flight civilian experts who have been suggesting new concepts for improving national security technique.—Department of the Air Force.

Communications Robot

The Navy's latest communications robot, capable of continuously originating and sending 60 simultaneous messages from a supersonic missile to the robot's dual ground control station, has been placed in operation at the Naval Ordnance Test Station, Inyokern, California.

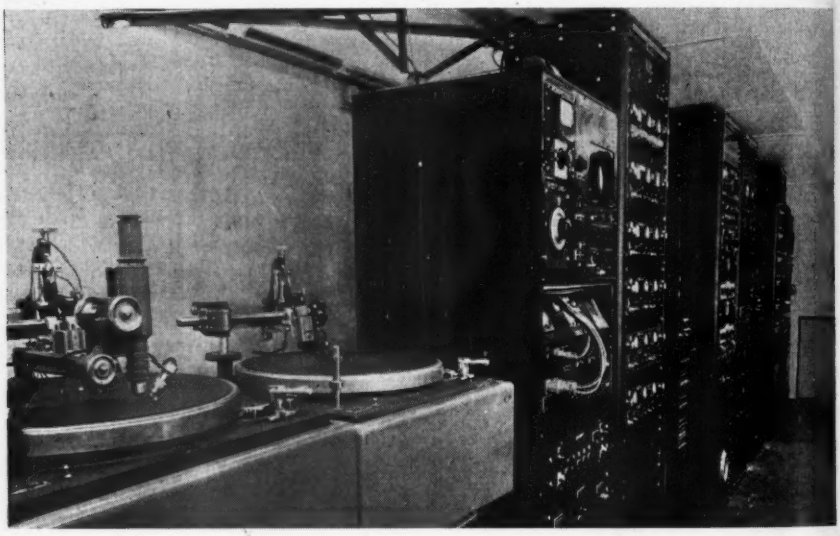
Described by its designers as the most advanced radio-telemetering system in existence, it acts as a group of airborne observers and radio operators in gathering and transmitting scientific data from the flying missile.

The system's two ground control stations have been installed in a trailer to permit ready movement to the best location for satisfactory reception.

Telemetering is the method employed to obtain flight information from airborne missiles on which observers cannot be carried. Also, except in special instances, the recovery of records after landing has not yet proved satisfactory and ground testing generally is inadequate.

The telemetering equipment consists of a series of electronically-controlled "pick-ups" placed at various points in the missile and electrically connected at a central point. The pick-ups convert information on the flight behavior of the missile to electric signals, which are combined at the control point and used to modulate a radio transmitter.

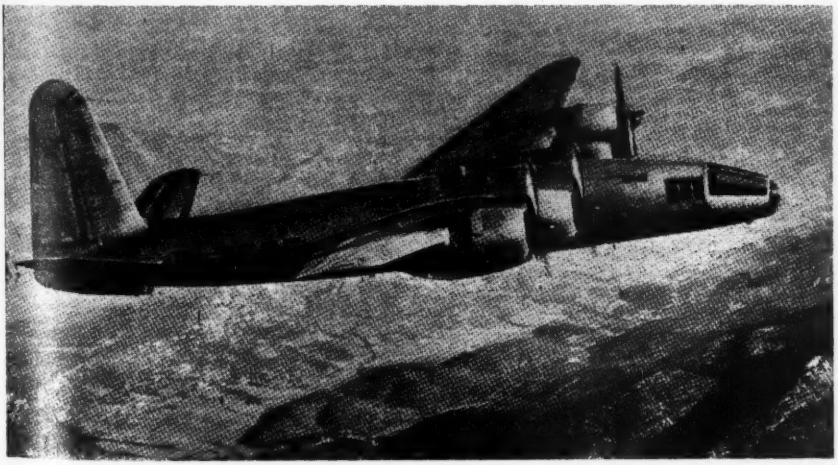
Transmissions from the missile's airborne radio are received by the ground stations in the trailer where the electric signals are then separated and recorded. From these records, with a knowledge of the calibrations of the pick-ups and the receiving equipment, the original information can be reproduced as a function of time.—Department of the Navy.



Two ground control stations of a new Navy communications robot are installed in a trailer to permit ready movement. Equipment includes two recorders and telemetering apparatus.—US Navy photo.

FRANCE

New French Aircraft



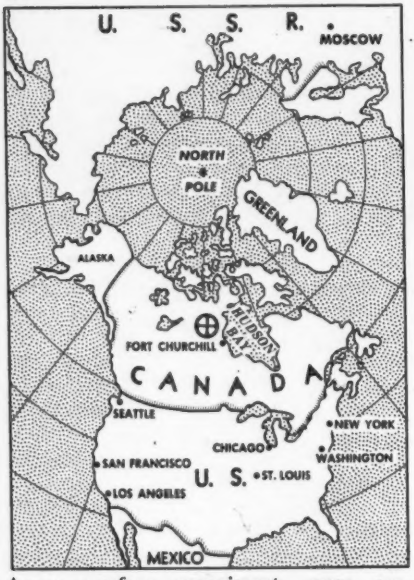
One of the best French jet fighters now flying is the Aerosudouest *SO 6020 Gerfaut*, above; it is the swept-back wing version of an earlier model made by the same manufacturer. Below, the *SE 1010* high-altitude photographic survey aircraft, now in use by the French Air Force.—*The Aeroplane.*

CANADA

Arctic Warfare

Following extensive experiments conducted by the United States and Canada at Fort Churchill, Canada, the conviction is now fully established that large-scale warfare in the Canadian Arctic is an impossibility. There can be no movement or deployment of armies, corps, divisions, or perhaps even brigades.

Any military action in the north, it appears, would have to be on a small scale



Arctic warfare experiments were conducted from Canada's Fort Churchill.

to be effective—small battle groups of men, armored vehicles, guns, and aircraft.

Airborne troops will be an integral part of any northern force.

The US and Canadian military planners appear to have abandoned any thought of a full-scale invasion across the Polar region. On the basis of experience at Fort Churchill and elsewhere, they just do not think it could be done.

What they know could be done is that a potential enemy could establish a token foothold on any of the thousands of islands in the Canadian Arctic, or anywhere in the sparsely-populated area of northern Canada.

Thus, a diversion would be created that might keep large bodies of Canadian and United States forces preoccupied, cutting down on the forces available for action in more active theaters elsewhere.

The object, therefore, is to evolve techniques that would enable such enemy forces to be attacked quickly and decisively, using minimum numbers of troops.

As the tests progressed, it was found that troops with wartime combat experience were able to adapt themselves quite readily to new conditions. After a few weeks of training, these men were reasonably self-sufficient, to a point where about 90 percent of their time was devoted to moving and keeping alive, leaving 10 percent for the business of fighting.

The object of further research will be to adjust these percentages so that more and more of the Arctic soldiers' time will be available for combat. The Eskimo spends almost 100 percent of his time providing himself with food and shelter.

The infantryman's main enemy in the absence of hostile troops is frostbite.

The Arctic soldier must not perspire, or he will freeze when he cools off. He must guard against snow blindness by wearing goggles. He must eat plenty of well-cooked food and must carry a pressure cooker in which to prepare it, as water must be obtained by melting snow or ice.

He must keep his weapons free from snow and must not let a hot rifle barrel touch the snow. He must know how to find Arctic berries, roots, animals, and fish in case his supplies are cut off.—*The New York Times.*

GREAT BRITAIN

Gibraltar Air Field

The problem of constructing an airfield at Gibraltar was difficult because of the lack of enough level ground in the restricted space under British control. In solving the problem, the runway was built out into the sea, as shown above, and its construction proved to be of great value during World War II.—*The Illustrated London News* photo.

AUSTRALIA

Atomic Research Center

Establishment of an atomic research center in Australia and the possible manufacture of atomic weapons in the Commonwealth are expected to result from the transfer of Britain's chief scientist in this field to the University of Canberra.

As part of its program to strengthen Australia's defenses, the government has appointed the Secretary for the Department of the Interior to direct the new civil defense organization which will advise the government on matters of civil defense. One task will be to protect civilians against atomic war.—*Australian Weekly Review.*

NORWAY

German Forts

When the German war machine collapsed in May 1945, the government of Norway came into possession of a vast network of 387 fortresses, heavily fortified artillery positions, and camouflaged gun emplacements that included the world's largest coastal batteries.

The powerful Trondenes Fortress—as the defense line is known—was an involuntary "gift" from the Germans. They left the defenses virtually intact at the time of surrender.

The system begins just below the Arctic Circle on the island of Roervik and extends north around the key coastal city of Narvik.—*The New York Times.*

BRAZIL

National Research Board

The President of Brazil has appointed a National Research Board which will promote, stimulate, and coordinate scientific and technological research. The Board will work closely with the Brazilian Academy of Science, giving special attention to atomic energy research.

The Board consists of a president and a vice president, appointed by the Chief Executive, and 25 other members. The members will include representatives from the Armed Forces General Staff; the Ministries of Agriculture, Education, Labor, and State; and the National Board of Economy. Other members will be chosen from among the best known scientists and industrialists in the country.—*Brazilian Bulletin.*

BOLIVIA

Technical Schools

In December 1947, the Bolivian government decided to establish and operate the following technical schools: Engineer and Signal School, Military Railway Service School, Automotive School, and School for Mechanics and Armorers.

The Engineer and Signal School, located at the Cochabamba military post, has been in operation since July 1948. The duration of this course is approximately 6 months. The course objective is to provide officers with the necessary qualifications for attendance at higher-level colleges and universities.

Because of the lack of qualified personnel and facilities for teaching such specialized subjects in Bolivia, selected officers have been undergoing specialized studies in foreign countries. So far, one construction engineer, three chemical engineers, one electrical engineer, and others trained in military specialties, have returned after having successfully completed their respective courses.—*Revista Militar,* Bolivia.

TURKEY

US Aid Program

International developments and the strategic position of Turkey have required that she be prepared to resist invasion. Therefore, after maintaining the Turkish armed forces at a wartime mobilization strength for 8 years, Turkey found her economy badly undermined. About 50 percent of the national revenue was required for national defense. Turkey requested aid from the United States and aid was authorized on 22 May 1947. Funds were appropriated on 30 July 1947.

In order to determine the specific aid necessary, a commission was sent to Turkey, with representatives from the State, Army, Navy, and Air Force Departments. The survey group recommended that United States policy be oriented toward two basic objectives: 1. Improvement of Turkey's economic status in the face of demands of her national security. 2. Maintenance of Turkish economic well-being to prevent development of serious social unrest which might be used by a potential aggressor as an opening for penetration and undermining of Turkish political and economic institutions. The group felt that these objectives could best be accomplished by concentrating on modernizing the Turkish Army to provide a smaller but more efficient force.

The mission of the Army Group (TUSAG) was to aid and advise the Turkish Army with respect to supply matters and to instruct Turkish personnel in the operation and maintenance of United States equipment and supplies. The mission has been expanded to include tactical instruction in Turkish service and staff schools.

Funds appropriated for the fiscal year 1949 will provide additional equipment to modernize the Turkish Army and to train Turkish personnel in modern tactical principles.—*Annual Report of the Secretary of the Army.*

The Strategic Importance of Canada

Digested by the MILITARY REVIEW from an article by Lieutenant Colonel G. J. H. Watts-ford (Canadian Army) in the "Australian Army Journal" (Australia) October-November 1948.

Geography and Resources

THE Dominion of Canada comprises the whole northern part of the North American Continent with its islands, except the United States Territory of Alaska. It takes in the whole Arctic Archipelago between Davis Strait and the connecting waters to the 60th meridian on the east and the 141st meridian on the west. The Dominion is bounded on the west by Alaska and the Pacific Ocean; on the south by the United States; on the east by the Atlantic Ocean, Davis Strait, and the dividing waters between the Danish territory of Greenland and Ellesmere Island. Northward it extends to the North Pole.

The area of the Dominion is roughly 3,700,000 square miles which, for purposes of comparison, is a bit larger than the continental United States and Alaska, and about 700,000 square miles larger than Australia.

Politically, Canada is divided into 10 provinces and 2 territories. Each province has its own government, and the Yukon and North West Territories are administered by the Dominion government.

Maritime Provinces

Prince Edward Island, Nova Scotia, New Brunswick and Newfoundland are known as the Maritime Provinces.

The country here is hilly with some heavily timbered areas and areas of good farm land.

The broken coast provides many good harbors. The only ocean ports open throughout the year are on the Atlantic seaboard. Halifax is the main eastern port.

Ontario and Quebec

The largest parts of the provinces of Ontario and Quebec lie within the physiographical formation known as the Canadian Shield, which is a vast "U"-shaped formation surrounding Hudson Bay. Its surface characteristic is hard rock, either exposed or overlain with shallow soil. The majority of the area is heavily timbered.

The southern portions of both provinces lie within the St. Lawrence Lowlands, a belt of land bordering the St. Lawrence River and extending westward through southern Ontario to Lake Huron. This area is the most densely populated in the Dominion and is an industrial area of considerable economic importance. The climatic conditions and fertile soil combine to make it suitable for mixed farming.

Manitoba, Saskatchewan, Alberta

The provinces of Manitoba and Sas-

katchewan consist mostly of flat or undulating, largely treeless, prairie. This area is overlain by clay soil and produces the bulk of Canada's wheat. As one travels westward, the land gradually rises from 800 feet at Winnipeg to 3,400 feet at Calgary in Alberta, 700 miles to the west. Here the country becomes much more undulating and good grazing land makes it suitable for raising cattle.

British Columbia

The mountain system which parallels the Pacific Coast includes nearly all of British Columbia and the Yukon. This system is generally referred to as the Rocky Mountains as the Rockies are the largest of the several ranges comprising the whole. Many of the summits reach 10,000 feet with occasional peaks over 13,000 feet. The area is heavily wooded and is one of Canada's main sources of lumber, pulp, and paper.

The Territories

Most people think of the northern part of Canada, consisting of the Yukon and North West Territories, as barren wastes. They are convinced that residents of this area, if there are any, are "God's frozen people." Strangely enough, this is not so.

To understand this area, it is important to realize that there is a marked distinction between the climates of the eastern and western Arctic. Along the Arctic Circle, the average July temperature ranges from 42° F. in South Baffin Island to about 60° F. on the lower Mackenzie River. Some agriculture is possible in the Mackenzie Valley, whereas in corresponding latitudes in the eastern Arctic there is only tundra. The tree line runs from just north of Churchill on Hudson Bay in the northwesterly direction to a point on the Arctic coast just east of the Mackenzie River.

The eastern Arctic in winter has the appearance of a flat, cold, wasteland relatively thinly covered with granular snow and in perpetual twilight or darkness. During the few summer weeks, the land takes on a marsh-like appearance due to the amount of water lying on the ground and to the profusion of wild flowers. The light precipitation in this area, and hence light snowfall, permits the frost to get deep into the ground—sometimes as much as 16 feet. In the northern part of the Territory, the ground never thaws more than 2 feet down. Consequently, there is no drainage and surface water results. One can readily imagine the difficulties of moving vehicles through this type of terrain in either summer or winter, but particularly during summer. The chief inhabitants of the area are the Eskimos. There are, however, a few hundred people of European descent, chiefly fur traders and trappers, miners, missionaries, and government officials.

The western portion of the North West Territories is below the tree line and is dominated by the valley of the Mackenzie River and the Great Slave and Great Bear Lakes. The valley of the Mackenzie is comparatively flat and has a good soil cover. The whole region is reasonably well covered with coniferous trees, especially along the river banks. There are many lakes and rivers.

Agriculture is somewhat restricted by the short summers and long, cold winters.

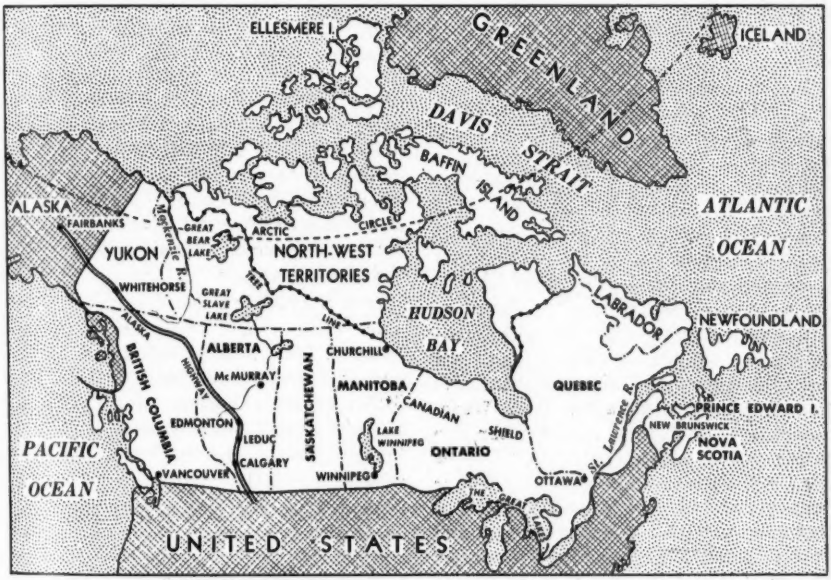
Resources

Viewed collectively, Canadian resources make an impressive total. In the past 5 years, Canada has averaged for export and carry-over, 633 million bushels of wheat a year. Canada's forests are exceeded in size by only two other countries. Her fishing grounds are the largest in the world. She is the world's largest producer of newsprint, platinum, asbestos, nickel, and radium. Canada is the world's second largest producer of aluminum,

wood pulp, and hydro-electric power. She is the third largest producer of copper, lead, and zinc, and ranks third as a trading nation and fourth in industrial production among the nations of the world. Her agricultural production is far in excess of her own needs.

Oil fields in Alberta produce a regular yield. During the war, oil from wells at Fort Norman was refined at the site and piped to Whitehorse on the Alaska highway. A recent development of some interest is the discovery of an oil field just south of Edmonton. Information concerning this field is still somewhat sketchy, but it has been prophesied that it will be equal in productive capacity to the average large American field.

A further important potential source of oil is the oil bearing sands which flank the Athabaska River near McMurray. It has been estimated that the supply of petroleum from the sands, if extracted, would equal the world's present annual output of crude oil for 130 years. At the present time, the problem of how to extract the petroleum economically has not yet been solved. With known petroleum resources as derived from wells being depleted at an alarming rate, this reserve may, however, prove to be of increasing importance.



'Canada's Global Position

Let us now look for a moment at Canada's position on the globe.

First, it is important to note that the main land masses of the earth lie north of the equator. The only major exceptions are Australia, South Africa, and South America. The 10 largest cities of the world lie between the Arctic Circle and the Tropic of Cancer and, of the 41 cities having a population of over 1,000,000,

only 9 lie outside this zone. This means that humanity's center of gravity is in the Northern Hemisphere, and that the dominant movement of passengers and freight must consequently also be in the Northern Hemisphere.

Recent technological advancements in aircraft have greatly increased the importance of great circle routes. Open or ice-filled seas or rugged terrain are almost equally unimportant to the modern airplane.

With this then in mind, if one looks at a map of the Northern Hemisphere, based with its center on the North Pole, one can see that Canada should no longer be thought of as being at the northern extremity of the American Continents. It is in a central location relative to the main land masses of the world, and in the center of global communications between Europe, America, and Asia.

In particular, it will be noted that Canada lies astride, or near to, direct air routes between the United States and Russia. For example, a line from Washington, D. C., to Leningrad passes through Quebec and is approximately 4,500 miles long. A line from Chicago to the Taimyr Peninsula on the north coast of central Russia, on the other hand, passes through central Canada and crosses the Arctic near the North Pole. It is 4,350 miles in length. A line from Chicago to East Cape would also pass through central Canada.

Normal Land or Airborne Forces

The first thing that is evident is that outright attack by normal land or airborne forces over such distances is definitely not feasible. How then could the North American continent be attacked?

Long-Range Guided Missiles

Much has been heard during the last few years of long-range guided missiles and the prospect of wars being waged with them, particularly over the North Pole. It will, however, be apparent that the day is still a long way off before guided missiles can be produced which would be effective at the ranges quoted. For technical reasons, the possibility of producing guided missiles with atomic war heads capable of such range is even more remote.

Long-Range Bombers

United States industrial areas are, however, vulnerable to long-range bombers attacking over the North Pole. At the present stage of development of long-range bomber aircraft, this might possibly mean that crews would have to abandon their craft and bail out. This would not necessarily be an expensive proposition when considered in relation to the damage that one aircraft could cause should it be carrying either an atomic bomb or biological bombs.

It is appreciated that the larger Canadian cities could not be considered immune from attack, but for the most part they are situated close to the United States border. Consequently, the ranges to them would be only slightly shorter than the ranges to much larger and more attractive targets.

Canadian—United States Relations

With regard to Canadian relations with the United States, 4,000 miles of common border have led to the development of close economic and cultural bonds between the two countries. Their legal systems have the same source, the common law of England.

Standards of living are similar and production, both industrial and agricultural, is also largely similar. Railways have a common gage and trains move freely back and forth across the border. The magazines, newspapers, and radio of each country circulate freely in the other. In the winter, thousands of Canadians go south to get warm, and in the summer, millions of Americans come north to get

cool. Canada is the best customer the United States has, and the United States is the best customer Canada has. In view of these facts, there is little wonder that the two nations are close to each other not only geographically but in many other ways.

Defense Cooperation

With regard to defense cooperation with the United States, a permanent Joint Board of Defense was set up in August 1940. The Board was given wide Terms of Reference which included that it should consider, in the broad sense, the defense of the northern half of the Western Hemisphere.

As a result of the Board's deliberations, the Prime Minister of Canada last year issued a statement on defense cooperation with the United States in which he stated that collaboration would be based on the following principles:

1. Interchange of personnel.

2. Exchange of observers in connection with exercises.

3. Encouragement of common designs and standards in arms, equipment, organization, methods of training and new developments.

With regard to this third principle, the Prime Minister pointed out that as certain United Kingdom standards had long been in use in Canada, no radical change was contemplated or practicable, and that the application of this principle would be gradual.

The fourth principle was the mutual and reciprocal availability of military, naval, and air facilities in each country.

The fifth and final underlying principle was that all cooperative arrangements would be without impairment of the control of either country over all activities in its territory.

In making this statement, the Prime Minister drew attention to the fact that the principles of cooperation as outlined by him closely paralleled the procedures which have long been applied between the nations of the British Commonwealth without formal agreement. He added that the similar arrangements now envisaged between Canada and the United States would in no way interfere with or replace Canada's Commonwealth connections in matters of defense training and organization.

Conclusion

Canada is a vast country, but to date

development has taken place largely within a long, comparatively narrow belt. It has great natural resources and industrial potential. It is situated centrally with regard to the main land masses of the world. Its climate varies from temperate to arctic, but the greater proportion of the country is suitable for settlement.

Although Canada is very much a part of the British Commonwealth, one cannot help but be struck by the close ties which exist between Canada and the United States. Whether anybody likes it

or not, the fortunes and misfortunes of Canada and the United States must always be closely linked.

It has often been said that one way in which Canada is of service to the British Commonwealth is that she acts as an interpreter between the Commonwealth and the United States. I suggest that with the increased cooperation and understanding which now exists between the United States and Canada, the term "interpreter" no longer adequately expresses this relationship. It is something more than that now and the fact that the role of interpreter has grown in stature can mean nothing but good for all concerned.

To sum up, I would say that Canada's strategic importance lies in the following facts:

1. Her central location on the globe.
2. Her large area.
3. Her world leadership in the possession and development of many natural resources which would be vital requirements in time of war.
4. Her industrial and agricultural potential.
5. Her position as a member of the British Commonwealth of Nations.
6. Her geographical proximity to the United States.
7. Her close economic and cultural ties and friendly relations with the United States.

Teeth for the United Nations

Digested by the MILITARY REVIEW from an article in "The Fighting Forces" (Great Britain) December 1948.

THE British Central Office of Information has recently published a handbook about the United Nations entitled "Britain and the United Nations." This illustrated handbook tells how the organization came into being and how it has fared thus far as an instrument of peace. It also describes the various commissions and agencies which UN has set up for the betterment of world conditions in such fields as food, agriculture, education, and the reestablishment of people who lost home and country through the war.

From the military standpoint, the chief interest in this handbook lies in what is said about the attempted formation of an International Force. We think it will be of value if we quote the relevant paragraphs in full:

"To faithful and fervent supporters of the idea of a really effective world organization, the Military Staff Committee, when it was first indicated in the Charter, seemed to be a particularly hopeful thing. It appeared to supply the United Nations with something which the League of Nations had always appeared to lack—'teeth.' That is to say, a body of national military, naval, and air contingents which were to be held at the immediate disposal of the Security Council. The strength and degree of readiness of these contingents, and the plans for their combined action, were to be determined by the Security Council with the assistance of its Military Staff Committee.

"That is what the Charter intended. How did the idea actually work out? The Military Staff Committee, composed of the representatives of the Chiefs of Staff of the United States, the Soviet Union, the United Kingdom, China, and France, was duly established. It held its first meeting in London on 3 February 1946. In the autumn of the same year, the General Assembly of the United Nations, evidently wondering what progress was being made, recommended that the Security Council

'accelerate as much as possible the placing at its disposal of the armed forces mentioned in Article 43 of the Charter.' The Security Council responded in February 1947, by directing the Military Staff Committee to report progress by 30 April.

"The report, when presented, consisted of 25 points of unanimous agreement, which formed the Committee's actual recommendations to the Security Council, and 16 points of disagreement in which the report gave the proposals of individual delegations. There was unanimous agreement that, for instance, contributions in the shape of armed forces or facilities must eventually come from all member nations. But to begin with, the Big Five would have to provide the biggest proportions. The Security Council alone should employ these armed forces. They should use them to suppress or forestall trouble by quick action and should only hold them so long as it was essential. The command of these contingents, when they were not actually engaged in dealing with trouble for the Security Council, should belong to the respective nations that had contributed them.

"Main disagreements included the question whether the Big Five should contribute exactly equal contingents of military, naval, and air forces. The Soviet delegation maintained that they should; the other four delegations recommended that they should make the same over-all contribution, but that contributions should be allowed to vary in the relative strength of their military, naval, and air components. On the question of bases from which collective action could be undertaken, the Russians said these were not mentioned in the Charter and therefore could not be included under the heading of 'facilities.' The other delegations wanted both bases and 'general guarantees of rights of passage' to be provided. Again, as to time limit, the Russians proposed that United Nations forces should be withdrawn within 30 to 90 days after preventive action had been completed. The other delegations were against setting any time limit.

"This report was discussed by the Security Council during June 1947. But after that, the peoples of the world found scarcely any mention in their newspapers of the activities of the Military Staff Committee of the United Nations. In fact, the next Military Committee that made news at all was the Permanent Military Committee of the five Brussels Powers—Britain, France, and the Benelux countries."

Thus, it will be seen that for many months practically nothing has been done to implement the intentions of the Charter on the most important of its provisions.

What the representatives of the Military Staff Committee and the Security Council seem to overlook is that the important thing is to get something in the nature of an International Force started. It may be small, it may be inadequate, it may not receive the unanimous approval of all the members of the Security Council, but let a start be made. Obviously, there would be difficulties. China, for example, would have found it impossible to provide an adequate naval contingent. But at least, a start would have been made.

According to their program, the General Assembly of the United Nations is dealing with this question of an International Force, though at the time of writing nothing seems to have been done about it. There is one aspect of the situation which should constantly be borne in mind. Fifth columns exist within the frontiers of every European state and are a constantly growing menace. If these unpleasant elements realized that there was in existence an International Force, ready to take immediate action if called upon, their hopes of gaining their revolutionary ends would be largely diminished.

The Atomic Threat and National Defense

Translated and digested by the MILITARY REVIEW from an article by Colonel Goutard in "Revue de Défense Nationale" (France) November 1948.

WHILE scientists in their laboratories seek to "improve" still further the methods of atomic destruction, and the cold war occupies the political and diplomatic fronts, it behooves military personnel to study the possible effects of new inventions on the problems of national defense. Such study may be guesswork, but it is preferable to the kind of preparations made for World War II.

"Never in the history of mankind, certainly, has anything affected man's thinking and his probable military behavior so drastically as has the atomic bomb." Thus, Major General James M. Gavin expresses himself in an article published in the *Infantry Journal* of December 1946.

Some go so far, therefore, as to wonder if there is any sense in maintaining costly ground and surface naval forces. Should we continue to depend on former concepts now that a few atomic bombs can wipe out conventional forces or destroy a country's capacity for resistance in a single blow? The justification of our daily efforts is being challenged. Here lies a threat to morale which could undermine the faith and enthusiasm of our armed forces. We must, therefore, squarely face this atomic threat. We must study the problem with our minds free of traditional concepts which might endanger future armies.

The essential conditions for defense against a threat are the determination of the nature of the threat, the probable method in which it will be employed, and the measures to be taken for limiting or neutralizing its effects. That is what we would do, were we placed in the position of an active defender who is resolved to seize the initiative at the earliest opportunity.

This leads us to examine the new aspects of mobilization. It will still be necessary to call on the reserves of the country and to assemble these forces at the right time. Strategic offensive operations, likewise, will still be necessary for ensuring victory.

Danger from the air—which is not necessarily atomic danger—is, first of all, represented by the airplane, which appears to be the truly strategic weapon. It may be loaded with atomic bombs, chemicals, or bacteriological agents. Aerial transport is not yet propelled by nuclear energy. We are really in the age of the thermal motor with its jet engines and rockets, although the age of the internal combustion engine has not yet passed.

The types of aircraft and flying missiles are quite diverse. Scientific and military reviews are full of information on this subject. In general, it may be said that there is no very clearly defined line that can be drawn between the different types of planes and flying missiles. There are piloted aircraft driven by reciprocating engines or jets, pilotless aircraft controlled automatically or by radio, and the so-called "self-propelled" devices with or without wing-surfaces.

We will, therefore, be called on to defend ourselves against a great variety of aircraft, not all of which are capable of carrying the atomic bomb at present. All of them may likely carry the atomic bomb when it has less weight and volume.

From the strategic point of view, several factors are of the greatest consequence. These factors include: range, which permits reaching the enemy from distant bases; speed, which permits surprise and prevents interception; precision at great distances; and, lastly, load capacity. All of these factors depend

more on the mode of propulsion and guidance than on the type of aircraft.

At the moment, planes propelled by reciprocating engines give the maximum ranges. Their bombing accuracy is excellent, as a result of new sighting devices. As for control, nothing will ever equal that of the human pilot within the plane. As for load capacity at the present time, only the B-50, with four motors of 3,500 hp each, and the six-motored B-36 are capable of transporting the new atomic bomb, which has a thicker metal shell.

Even if the reciprocating engine remains our No. 1 enemy for the time being, we can see that it can no longer be our defender. Defense requires a considerable margin of speed which the reciprocating engine is unable to furnish.

Aircraft propelled by thermal reaction (jets) enjoy this margin of speed. Fighters and interceptors should, therefore, adopt this method of propulsion. Today's turbo-jets have speeds up to 600 miles per hour, but so far no craft of this type has been able to cross the sonic barrier. Because of its high rate of fuel consumption, the weight of the fuel carried, and other technical reasons, the flying range of the jet plane at present hardly exceeds 900 to 1,200 miles.

For the time being, then, Europe need not fear jet-propelled bomber aircraft based beyond the oceans. Only those that might be based on the Continent, the northern islands, or in North Africa are a threat at present.

Rocket propulsion, which long ago passed the sonic barrier, seems to be the pattern for the future. The speeds attained have been sensational. The speed of the V-2 was 3,000 miles per hour. The V-3 (A-10) is reported to have attained 6,000 miles per hour in tests. As for piloted rocket aircraft, such as the Bell XS-1, they appear to attain speeds of 1,600 miles per hour. Probably the first piloted aircraft to have actually passed the sonic barrier was the De Havilland 108. A very laconic communique from the British Air Ministry recently informed us that a plane made by the De Havilland firm, with a pilot on board, had exceeded considerably the speed of sound.

In spite of these terrific speeds, however, the range of rocket aircraft remains small. Fuel is consumed in a few seconds or minutes. The V-1 had a range of only 150 miles and the V-2 of 225 miles. Moreover, the speed of these missiles and the considerable altitudes at which they achieve their maximum efficiency raise problems of control which are very difficult to solve. The V-2s directed against England were quite inaccurate. These difficulties will make it necessary for those countries which may contemplate using the rocket weapons to advance their launching and control bases as far forward as possible.

The Atomic Bomb

Now that we have considered the possibilities offered by aerial transportation, let us briefly examine the properties of the most powerful of transported weapons, the atomic bomb. No doubt there will be a great increase in the power of this weapon in the future, but this is no reason for doing nothing to protect ourselves from it. Even though we are unable to estimate the increase of its power, we may at least study the effects of the bombs that have been noted so far.

Atomic disintegration is accompanied by the liberation of a considerable quantity of energy in three forms:

1. Shock wave or blast effect.
2. Heat.
3. Radioactivity.

Let us examine these three effects on the basis of the Hiroshima and Nagasaki bombings and the two experiments at Bikini.

The blast effect of the atomic bomb is much more extensive than that of the

largest ordinary type high-explosive bomb. But the violence of the atomic blast diminishes rapidly with distance. For this reason, and the height at which the bomb was exploded at Hiroshima and Nagasaki, the maximum instantaneous pressure on the buildings nearest the bomb was less intense than if these buildings had been struck by an ordinary 10-ton high-explosive bomb. While light Japanese houses were destroyed over a radius of 2½ to 3 miles, reinforced concrete buildings that had been built to resist earthquakes were not destroyed.

At Bikini, during the aerial test, catastrophic results were produced on ships within a radius of 550 to 650 yards from the point of the explosion. Between 650 and 1,100 yards, only the light superstructures were damaged and the vital lower portions of the ships were left intact. Beyond 1,600 yards, no discernible deformations of structure were found. One submarine, although very close to the bomb, left under its own power a week after the explosion. Of particular interest to us are the results noted in the case of heavy weapons. Tanks, armored cars, and trucks which the Army had placed on the decks of the ships "resisted the blast very well," according to the French military observer.

Persons who were in the open near the immediate vicinity of the explosion at Hiroshima and Nagasaki collapsed and suffered fatal internal hemorrhages from the blasts. A little farther away, the effects were mainly indirect; men were thrown violently against walls or killed by flying debris.

The shock effects are largely the result of being directly exposed to the blast. At Hiroshima, where the terrain is somewhat broken, large areas escaped serious damage.

From all this, we are able to conclude the following:

That underground installations or solidly constructed concrete shelters would afford good protection.

That heavy matériel could be left without shelter.

That defiladed areas in mountains would provide protected zones.

That in the open country, some distance from the explosion, depressions and small hills would offer some protection.

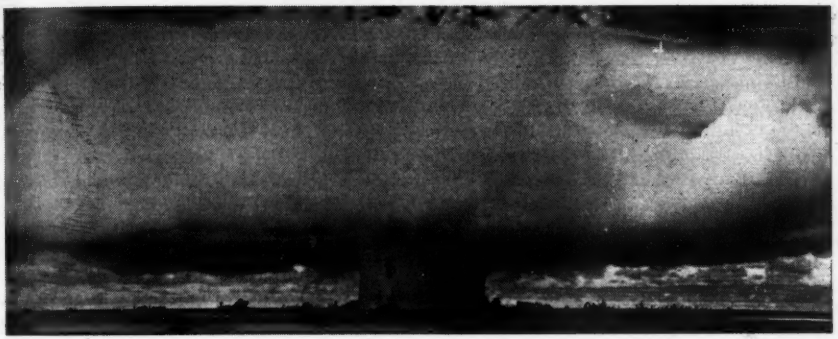
The heat wave produced by an atomic explosion lasts only a fraction of a second. At Hiroshima and Nagasaki, it set fire to entire sections of wooden houses. At Bikini, heat produced no serious effects on equipment beyond a 550 yard radius. Clothing and boxed food-stuffs which were placed on decks caught fire up to a distance of 1,650 yards when exposed directly to the radiation. But even a light mask intercepted the radiation and protected these objects. Artillery shells on the decks were not detonated.

Unsheltered persons obviously would be greatly affected by heat radiation, which would set fire to their clothing at distances of 1,650 yards and more. At Hiroshima and Nagasaki, the effects were fatal up to 1,300 yards. Burns on exposed skin of the face and hands occurred up to 4,500 yards. At these distances, clothing—especially white clothing—provided good protection. At these distances, also, shadows played an important role. Even trees provided sufficient protection, although their leaves were charred by the brief flash.

It appears that the measures recommended for use against the blast would be equally valuable against the heat wave.

Radioactivity, so dreaded by man, presents many analogies to the ordinary high-explosive bomb. Its effects have been compared to those of a lung-full of mustard gas, but radioactive products are more easily detected and more rapidly eliminated.

In the test of the air bomb at Bikini,



Above, the second atom bomb test at Bikini on 24 July 1946. Below, Hiroshima presents a picture of grotesque desolation from the atomic bombing of 5 August 1945.

This district near Nagasaki (below) was protected from the direct effects of the bomb by the hill in the background, but suffered from fission products.—US Army photos.

the products of the fission of plutonium were, for the most part, carried away in the cloud of gases. The small portion that contaminated the ships disappeared in a few hours or days. In the underwater test, the products of fission mixed with the water of a gigantic geyser which fell back on the ships in a radioactive shower that would have been extremely dangerous for the crews. On the second day, however, it was possible to board most of the vessels. On the fifth day, the entire water area was declared safe.

Radioactivity produces no marked effect on matériel. The cloud of radioactive gases produced was crossed immediately afterward by robot planes with registering instruments on board, without damage to their electric and radio equipment. But to personnel subjected to the aerial shower of neutrons and gamma rays, the effects will more likely be fatal than if they are exposed to mustard gas. The radiations bring about a progressive destruction of the white blood corpuscles, a change in the marrow of the bones where these blood cells are produced, and serious burns of mucous membranes. The effects do not appear until several hours after exposure. They would not, therefore, stop the immediate activity of the combatants who had been exposed.

At Hiroshima and Nagasaki, radiation effects were fatal over a varying period of time for persons who were within 1,100 yards of the blast center. Beyond this limit, the effects varied in seriousness, resulting in some cases in abortion in pregnant women, and the falling of hair. Beyond 2,600 yards, the effects were minor.

The thickness of objects which masked the effects of the explosion was also a factor. Some persons who had been protected from the shock and heat wave by intervening objects and believed that they had been saved from the effects of the explosion, died a few days later. In a large reinforced concrete building which stood very near the explosion, some persons died, others only became sick, and others were unharmed. The degree of effect depended on the number of walls or ceilings which had been between them and the explosion.

At Bikini, only animals on board the ships were exposed to radiation. Information on the results has been kept secret. In one case, however, it was noted that a pig on one of the ships was rescued 4 hours after the ship had gone down. This ship had been only 550 yards from the explosion. The pig was little affected. Doubtless, it had been protected by a mask of several decks.

For combatants in open country, the problem is entirely different. It appears that their only hope is dispersion, chance protection, or individual luck.

There is a story from Japanese sources, but for the accuracy of which I cannot vouch, that within a few hours after the bombing of Hiroshima, Japanese scientists called before the High Command of the Army were asked if they could develop an atomic bomb in 6 months or less. Their answer was "no." They were then asked could they develop a positive defense against such a bomb. Their answer was "no," that the only defense was to keep American B-29s from flying over Japan, and that was impossible. The story goes on that the decision to surrender was made within 3 hours after this conference with the scientists.

Major General Leslie R. Groves

Russian Combat in Cities

Translated and digested by the MILITARY REVIEW from an article by Colonel General Tchuikov (USSR) in "Informations Militaires" (France) 10 November 1948—10 December 1948.

WESTERN Poland and Eastern Germany contained many cities which the Germans took great pains to defend. In many instances, these cities had been transformed into resistance centers which could hold out even when surrounded. These localities and other strong points were protected by interlocking fire. Intervals were barred by field works and the attacker was forced to penetrate several defense zones. Widening a breach in such a position was very difficult because the Germans counterattacked vigorously from the flanks. As a result, it was generally necessary to seize two of these localities in order to destroy their system of flanking fire and to permit the movement of reserves into the breach.

The German cities were surrounded by an outer belt of field fortifications. These works, with the fortified suburbs, made a very strong defensive zone. Brick, stone, or reinforced concrete buildings were transformed into permanent-type fortifications. Public buildings and factories had thick walls and solid basements. In Berlin, even the subway and the parks had been strongly organized for defense. All these strong points were covered by barricades erected in all principal streets.

Characteristics of Combat in Cities

The battle for a city is made up of the following phases: the attack of the outlying field positions; the capture of the outskirts of the city; and the advance toward the center of the city. The first positions are attacked by lines of skirmishers, but the fighting on the outskirts and in the interior of the city requires other formations. The outskirts are attacked by assault groups supported by lines of skirmishers. In the interior of the city, the fight for houses or blocks of houses, parks, subway stations, railway stations, or large factories, is carried out by assault groups which have been reinforced by additional heavy weapons. Large units cannot operate in the interior of cities, as the streets and squares are swept by fire from houses and basements. Such fire is highly dangerous to infantry and tanks. Fighting here is conducted at close range. The enemy may be behind each window, corner, or wall. Such a situation calls for a great deal of initiative and determination on the part of the individual soldier.

Organization of the Assault

As forces approach a city, its defenses must be reconnoitered and all fire power employed for suppressing enemy fire. The defending forces must be weakened sufficiently to permit the infantry and assault groups to approach close enough to take the field positions. As soon as the friendly artillery lifts its fire, the attacking forces must establish themselves in the outskirts of the city. The assault groups then go into action.

In attacks on large cities, a division is assigned a section. A regiment, with its reinforcing forces, is allotted a few streets and quarters. A battalion is assigned a street or small area. The reinforced battalion is the tactical unit for combat in a city. Its commander organizes assault groups to which he gives the necessary fire support. He assigns the objectives. As the attack progresses, he organizes new assault groups from his reserves to relieve those which have been previously engaged, thus ensuring the uninterrupted progress of the attack.

The infantry battalion, when employed as an assault detachment, is reinforced as follows: a platoon or a company of

engineers, one or two heavy machine-gun platoons, a detachment or a platoon of portable flame throwers, one or two companies of tanks or a battery of self-propelled guns, one battery of 120-mm mortars, one platoon of 45-mm guns, and one or two batteries from the division artillery. In addition, if the circumstances require, an assault battalion has one 152-mm battery, one 203-mm battery, and a battery of mortars attached to it as well.

The battalion forms three to six assault groups, and one reinforcing group from the forces which are not assigned to the assault groups. It also provides a company or platoon as a reserve. This reserve is used to supply complementary assault groups, to relieve groups which are engaged, or to exploit a success.

The assault group is formed according to its mission and objective. It may consist of a platoon or a company with half of a platoon or a platoon of machine guns, one or two heavy machine guns, one or two squads of engineers, two to five flame throwers, two or three soldiers armed with either incendiary or smoke generating equipment, four to six 45- or 76-mm guns (sometimes guns of heavier caliber), one platoon or one company of tanks, and one platoon of self-propelled guns.

The assault group is the basic element in street fighting. It is divided into four sub-groups. The assault sub-group consists of a squad of men with rifles or automatic weapons, a few flame throwers, engineers, and smoke-producing equipment. Its armament also includes an automatic rifle, grenades, incendiary grenades, knives, and engineer tools. Its role is to penetrate into the objective and wipe out its defenders.

The sub-groups which are used for protection or for reinforcement are equipped with machine guns on carriages, heavy guns, and (or) tanks. Their purpose is to make it possible for the assault sub-groups to penetrate into the objective, to liquidate the most troublesome of the enemy's firing points, and to destroy the retreating enemy.

The reserve consists of a platoon or fraction of a platoon of rifle troops. Its purpose is to make possible the uninterrupted execution of the attack by filling in the gaps produced by losses or by providing additional assault groups.

Action of Assault Groups

As soon as portions of the outskirts of a city have been seized, the tanks, self-propelled guns, and the machine guns take the streets under fire to prevent enemy counterattacks and to permit rapid exploitation of the success of the assault forces. Under their protection, the other guns are brought up and put into action, relieving the initial forces which continue on with the assault infantry. The guns fire at the lower stories of buildings to create breaches in them, while the fire of the machine guns is directed at the windows of the upper stories and roofs.

The assault groups, accompanied by the tanks, pass over to the attack, penetrate into the buildings through windows and breaches, and clear a passage for themselves with grenades, flame throwers, and automatic weapons. The advance is made under the protection of machine guns installed in the lower stories of the buildings which have already been captured, after the heavy guns and the tanks have silenced the principal enemy firing points. Tanks must be carefully protected against close-range weapons. Fighting inside buildings is hard and dangerous. The least hesitation on the part of the attacker may cost him his life. One must act boldly and rapidly. Before entering a room, a grenade is tossed into it. Flame throwers are used against enemy forces hiding in basements. Before climbing a stairway, smoke grenades are thrown ahead and the stairs are sprayed with

bullets from automatic weapons. The troops advance by bounds. On arriving at the next story, a grenade is attached to the doorknob. The explosion will force the door and confuse the enemy behind it. House fighting is carried on without interruption until the enemy is annihilated.

If the upper stories are cleaned out, but the enemy still remains in the basement where entrances prevent the use of grenades or flame throwers, water mains connected to the fire extinguisher system may be broken in order to drown the occupants.

A breach is blown in the wall with explosives to permit passing from one house to another.

In the intervals between fighting, the assault groups must be trained to be bold and to use initiative. During an assault, the leaders of these groups must attempt to achieve the following results:

1. Complete isolation of the building which is under attack, in order to prevent the enemy from bringing in reinforcements or from withdrawing.

2. Provide timely reinforcement of attacking forces by drawing on reserves, in order to ensure annihilation of the enemy and possession of the captured buildings.

3. Personally direct mopping-up operations and the organization of the assault sub-groups which are to attack the succeeding buildings.

There must be no interruption in the fighting. As soon as one building is captured, the attack is started immediately on the next to prevent the enemy from recovering from the initial shock.

Assault groups, tanks, and self-propelled guns move boldly, paying no attention to being cut off from the rear. It is the mission of the reserve to widen the base of the breach and to ensure its possession.

If large garrisons exist in solidly organized buildings, the buildings should be isolated by fire from other structures and set afire by flame throwers or projectiles. When the building burns, the enemy must evacuate it.

Tanks and Self-Propelled Guns

During an attack, tanks, and self-propelled guns move behind the infantry, giving support with their fire. They deliver fire either from the halt or while on the move. Their fire is directed at windows and barricades and at all enemy firing points. As long as the enemy is covering the streets with rifle and machine-gun fire, the tanks move forward through openings made in walls and courts. It is the task of the engineers to open these paths in order to permit engaging the enemy from the flanks or rear.

At times, armored vehicles move through the streets. In this case, one of them hugs the right side of the street, firing on the houses on the left, while the other stays close to the left side, firing on the houses on the right. A third tank, a little to the rear under the protection of infantry, covers the street with its fire.

Tanks and heavy guns, including self-propelled guns, are also kept in reserve by the commander of the assault detachment. They are employed against structures which resist the fire of ordinary artillery.

After the resistance of the exterior belt of fortifications has been broken, tanks carrying infantry from the assault groups or the reserve attempt to penetrate into the city to disorganize its defense. As soon as the assigned objective is taken, the rifle forces dismount from the tanks and mop up the buildings. The commanders of the assault detachments throw their reserves into the passage thus opened to exploit the success. Flame-thrower tanks give valuable service in cities, opening breaches with their guns and setting fire to buildings.

A firm hold must be maintained on all captured points by occupying them with reserves.

Visibility for the attacker is very limited in cities. This difficulty is countered by the employment of numerous observation and listening posts. Liaison between these posts and the command posts of the troop commanders and headquarters is maintained by telephone, radio, runners, and liaison officers. Within the assault groups, liaison is maintained by runners and by rockets or other prearranged signals. All echelons of the command remain in close proximity to the engaged units.

Organization of Defense

The defense of cities is based on the defense of houses and other structures. High buildings provide a good view and a good field of fire into the neighboring streets and constitute good strong points. The highly developed network of subterranean passages (sewers, basements, and tunnels) which can serve for shelters, command posts, and concealed movement, give a special characteristic to combat in cities. The same can also be said of the streets, squares, and courts, which make the construction of trenches and the planting of mines difficult.

In addition to the energy of the defenders, the morale factor, and the tactics employed, the organization of the defense played an important role at Stalingrad. It consisted of positions echeloned in depth, strong points, and centers of resistance. Interlocking fire covered the intervals. These anchor points of the defense consisted of one or two solid stone structures which could be defended even when surrounded, and which could block the enemy's directions of attack. They were defended by a platoon, by a company, and sometimes by a battalion reinforced with artillery and other weapons, according to the size of the building. A group of strong points, comprising a fire system and placed under a single command, constituted a resistance center which was usually manned by a reinforced battalion.

The first position of resistance surrounding a city passes through its outskirts. It is the principal position. It consists of buildings organized for defense, with fortifications in the intervals. Up to about a mile outside of this position, a similar security position is organized.

Defensive positions in the interior of the city are constructed along broad streets, rivers, and canals. The zones of the city which contain military or industrial establishments and corner buildings from which several streets may be covered are carefully fortified. The central portion of the city, where large buildings are found, constitutes a special center of resistance.

The defensive positions make up a zone of strong points which are echeloned in depth. These positions are situated at favorable street intersections, in squares, and inside of parks. Streets and squares are blocked by obstacles which are covered by flanking or oblique fire from neighboring buildings or specially constructed bunkers. Subterranean passages which provide a protected passageway into the rear of the enemy are organized for defense.

In the case of a building several stories high, the distribution of fire depends on the strength of the building's construction and its situation in the street or on a square. In general, several stories of fire are established. In the basements and lower stories, enfilading fire covering the street is planned. From the upper stories, the street, courts, neighboring structures, and distant objects are covered. Usually, direct-fire guns and machine guns for short-range fire are placed in the lower stories. The rest of the machine guns and the anti-

aircraft guns are placed in upper stories or on the roofs. Troops are distributed throughout the entire building. Certain guns use direct fire. Tanks, self-propelled guns, and machine guns provide flanking fire for intervals and points of access.

In combat in cities, it is necessary that the infantry possess many automatic weapons. A network of alternate firing positions for all types of weapons must be prepared. All this requires more time than a normal organization in the field.

Particular importance is attached to antitank defense. It must be able to stop a massive attack by armored vehicles by preventing them from penetrating into the streets. Those which do succeed in penetrating into the city must be destroyed. Antitank fighting is carried out at short range. Special antitank weapons and tank destroyers play an important role in this combat, being employed or operating from ambush through openings cut in walls and enclosures, ventilator openings, and doors.

The antitank defense must be organized in depth. It is organized entirely around the strong points. If isolated batteries are employed, they are installed as a point of resistance against tanks, principally in areas favorable to tank attacks. Mobile antitank reserves are maintained. Engineers must be provided with the necessary tools for cutting through whatever type of pavement covers the streets before mines can be placed. Certain walls may also be prepared for demolition so as to fall on tanks.

Combat Formations

It is important that the defense of a city be echeloned in depth. Regiments and divisions, as well as artillery groups, form two echelons. A mobile antitank reserve is maintained and, at times, a tank reserve. Infantry companies and battalions form two echelons. If there are few troops, only one echelon with a strong reserve is formed.

The second echelon and the reserves are to be used to support and to reinforce the first echelon by counterattacks in their own or adjoining sectors.

The infantry battalion defends a sector ½ to 1 mile wide and ½ mile deep. It organizes the strong points located in this zone. Company sub-sectors and special strong points are formed. At times, the battalion is able to defend a single resistance center or even a single strong point that is particularly important. The battalion reserve is composed of a platoon or company. The battalion resistance center should cover the most important direction of attack and it must be organized for all-around defense.

The infantry company is assigned several blocks of houses, divided by two or three penetrating streets and two transversal streets. The area is usually divided up into platoon defense zones. The company front is from 300 to 500 yards in width, with a depth of from 150 to 200 yards. At times, a company has only one strong point to defend, such as one or two especially important houses or a large factory.

The infantry platoon defends a group of houses. Its front may be 200 yards wide and 100 yards deep. It may also be assigned the mission of defending a single house which forms a strong point.

All units making up the garrison of a strong point or resistance center are provided with machine-gun pistols, flame throwers, machine guns, engineers, antitank rifles, mortars, and larger guns and tanks, if necessary. They are supported by artillery fire from defiladed positions. The commander of the infantry unit commands the strong point.

Conduct of the Battle

Personal reconnaissance by command-

ers of all grades has a large influence on the conduct of the battle. It requires a great deal more time than for an operation in the field.

The infantry regimental commander specifies the front limits of the defense position, the system of strong points, the resistance centers, and the principal strong points of the individual companies. He determines the demolitions which are to be carried out and the obstacles to be established. He organizes the fire support in front of the outer defenses, the points of contact between battalions, the eventual direction of counterattacks by the reserves, and the measures for ensuring the movement of the reserves.

After conducting their own reconnaissance, commanders of infantry battalions and companies organize the defense of their strong points, resistance centers, and intervals. They determine the forces which are to occupy the various positions, assign missions, indicate the positions which the machine guns and heavier guns are to occupy for direct fire, and fix the routes for counterattacks.

Each resistance center and strong point is given a plan of defense, which indicates its mission, its fire plan, its all-around defense, the missions of adjoining units, and the artillery plan. The defense plan specifies the organization of counterattacks, the measures to be taken in case of the loss of a few strong points, the distribution of forces, and the measures to be taken in case of attack. Fire power for the defense of the strong point is also indicated. The fire that will be used to cover intervals, cooperation with adjoining strong points, and the measures to be taken in case the enemy penetrates one of the strong points, are also planned in advance.

Employment of Supporting Arms

Engineer forces have varied and important missions. They participate in the organization for defense, particularly in preparing concrete works, in camouflaging important points, in providing water, and in constructing substantial shelters for headquarters, hospitals, and reserves. Engineers prepare for the eventual demolition of electric power plants, bridges, telegraph or telephone stations, depots, water mains, and factories. They assist in the construction of antitank and antipersonnel obstacles, mine fields, barricades, traps, and wire entanglements, either in front or inside of the position. They ensure the destruction of certain buildings, the electrification of certain obstacles, and the establishment of passages and screens.

The artillery increases the strength of the strong points and supports counterattacks. Small-caliber and antitank guns are located between strong points. Artillery units are at the disposal of the strong-point commander and are kept in readiness to maneuver with their fire or by a change of position.

Artillery assigned to the strong points or resistance centers is under the command of the latter and is used in direct or point-blank fire. An artillery officer is designated to command it, and he is the potential replacement for the strong-point commander.

All antiaircraft guns are kept in readiness to fire against ground objectives.

Tanks and self-propelled guns reinforce certain strong points and resistance centers, cooperate in counterattacks, and form a reserve which is at the disposal of the troop commander of all the various arms. These weapons are employed against both enemy personnel and matériel. They are placed in battery in shelters or in tank trenches, and several positions are provided. They may be used by themselves as mobile fire points.

Flame throwers and other incendiary devices are employed as reinforcements for antitank and antipersonnel defense or for demolitions.

Smoke-producing devices are employed for screening the movements of reserves, for launching counterattacks, or for screening bridges or certain passageways on the edge or inside of the city.

Conduct of Defensive Combat

The defense of a city must be aggressive. Attempt is made to inflict losses on the enemy from the very beginning by use of artillery, aviation, and obstacles. Effort is made to destroy the enemy forces in one swift operation. The defenders of Stalingrad made many counterattacks in the approaches of the city. In this way, they weakened and troubled the Germans considerably, often forcing them to make new plans for counterattacks. Every penetration of the enemy into the city, as a rule, should be liquidated by vigorous counterattack. The defense of Stalingrad was marked by the following measures:

1. Careful preparation of every sort of fire system for repulsing the attack and for destroying the enemy forces which were concentrated for the attack.

2. Organization of the defense in depth. This permitted quick reaction against enemy forces which had succeeded in effecting penetrations and facilitated attacks against the assailant's weak points, particularly when gaps or open flanks developed.

3. Employment of two echelons and the reserves to reestablish a previously held position and to retake lost points. Support is provided by tanks, heavy guns, and flame throwers.

4. Lastly, extensive use of infantry fire by picked marksmen, of machine guns, of artillery in direct fire, of demolitions, and of groups operating against the enemy rear.

Morale is of great importance. Morale makes it possible for garrisons of only moderate strength to resist for a long period when encircled, thus inflicting severe losses on the enemy and breaking his spirit. The defenders must take advantage of this and carry out successful counterattacks. Again, Stalingrad provided an example. Its defenders followed an unwritten rule that no strong point or portion of a house which had been lost was to be abandoned without orders, even in case of destruction by the enemy. It was tenacity which gave victory.

Modern close combat pertains not to infantry alone, but to other arms as well. It is the most important stage of modern battle, the stage in which the issue of every battle is decided.

Colonel General N. Chibisov, USSR.

Will the Airship Return?

Digested by the MILITARY REVIEW from an article by A. J. Huxley in "The Royal Air Force Quarterly" (Great Britain) January 1949.

THE heavy financial losses that continue to be incurred by British and many foreign airlines — including American companies with the most up-to-date equipment—have made many experts urge the revival of the airship. They believe that lighter-than-air craft can be both the cheapest and the safest form of air transport. It is perhaps surprising to recall that before the war commercial airships made a profit. Moreover, they had only one serious accident, compared with the continuous record of airplane disasters.

The airship is a displacement craft, like the seagoing vessel, which it resembles more than it does the airplane. It should be dissociated from the latter and allowed to stand in a class of its own. In the past, it has not only proved its commercial worth but has been valuable for aerial survey, charting, photography and exploration, and rescue and police operations. During the war, US Navy "blimps" made 55,900 operational flights of 9 to 10 hours average duration on antisubmarine patrols, convoy protection, mine spotting, and rescue work.

The airship has a far larger lifting capacity than the airplane, and this can be used either for large payload or long range. This buoyancy is obtained from hydrogen or helium gas. Hydrogen is readily produced and is lighter, but has been responsible for too many disasters for continued use. Natural helium, however, occurs in useful quantity only in the United States and Russia (Siberia). Any attempts to revive airships in Britain will depend on America's willingness to sell helium and will involve the costly transportation of the gas to Britain. It is feasible that helium may in time be produced by an atom-splitting process.

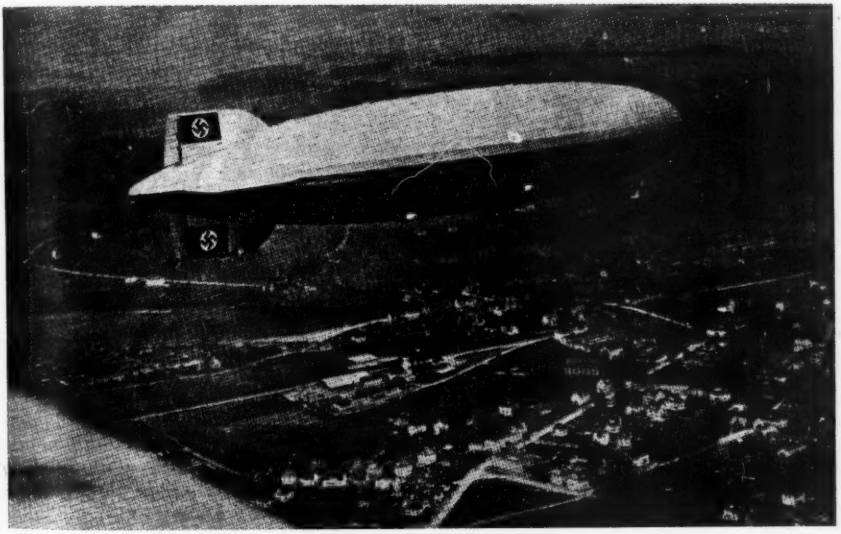
The modern airship, with cruising speed of at least 75 mph, would be three or four times faster than an ocean-going liner and about a quarter as fast as a modern airplane such as the Constellation. On the 2,000-mile flight between Britain and Newfoundland, on the North Atlantic route, for instance, the airplane would cross in 10 hours and the airship in 25. The *Queen Elizabeth* takes 4 days. But the prevailing westerly winds over the Atlantic would place the airship at a disadvantage. A 20 mph wind is often met and would increase the airship's time to 33 hours, and the airplane's to 11. The maximum likely wind of around 45 mph would set the airship back to 57 hours and the airplane to 13. Even so, remember that the airship would fly to North America in one "hop," while the airplane takes three. Delays to the airship while crossing would often balance out against delays to airplanes grounded by the weather. Moreover, the airship has a large enough fuel reserve to navigate around bad weather.

No advertised Zeppelin flight was ever canceled or turned back by weather or any other cause. Today, with improved mooring masts and modern instruments such as auto-pilots, radio altimeters, and radar navigation and landing aids, airships should be 100 percent safe in any weather. In fog, they can come in slowly and wait, while the airplane must land and at its usual speed. If engine failure occurs, the airship can remain in the air while repairs are effected. The *Hindenburg* once had temporary engine failure in a storm and none of the passengers realized it. If these failures are unrepairable, it can radio for help and descend gradually to ground or sea level. It can ride out storms up to 100 mph on its mooring mast, and greater winds at altitude.

There is ample room in airships, including space for private cabins, lounges, dining rooms, and observation galleries. There is little noise or vibration, and airsickness does not assail the passengers. The airship's popularity is shown by the bookings on the *Hindenburg*, which averaged 90 percent of the 72 seats. Large spaces are available within the envelope for freight stowage, particularly valuable for bulky cargo of low density or difficult shape.

Among the airship's disadvantages are its need for immense maintenance hangars and the difficulties of maneuvering in and out of these in side winds. But these maneuvers and normal landing can be facilitated by the use of tracked vehicles. The cost of these, hangars and mooring mast, is far less than for the long multiple runways required by airplanes. The landing area can be far smaller. The airship does not need a cumbersome undercarriage, and the danger involved in landing an airplane is not present.

Airships have a remarkable safety record. There have been accidents, but all but one were to military or experimental ships. The one accident on a scheduled flight was that to the *Hindenburg*, which caught fire while mooring at Lakehurst, New York, in May 1937. Thirteen passengers and 23 crew members were killed out of 97 persons on board. This accident could not have occurred to a helium-filled airship. But up to 1937, the *Hindenburg*, *Graf Zeppelin*, and a few smaller airships in Europe had carried 51,847 passengers over 1,403,000 miles without an accident—a record unparalleled by



Airships, such as the *Hindenburg*, above, may prove to be the cheapest and the safest form of air transport in the future, according to this British writer.

airplanes. This included more than a million miles over the Atlantic route.

Ranges of over 3,000 miles are particularly suited to the airship, which is capable of long nonstop flights. The longer the flight the lower the cost per mile. A small nonrigid Goodyear airship recently made a record powered flight of 7 days 2¼ hours without refuelling.

Since the last commercial airship was built before the war, there have been great advances in engines, propellers, instruments, structural methods, light alloys, and plastic fabrics. All these could be combined to produce airships of greater speed and weight-lifting capacity, complete safety, and reliability.

The biggest postwar airship project is a $375,000 contract awarded in September by the US Navy to the American Goodyear Corporation for the design of a long-range ocean and polar patrol blimp. Powered by two 800 horsepower Cyclone engines, each able to drive one or both of the 18-foot propellers, the craft will have a crew of 14. It will have a tricycle landing gear retracting into the double-deck gondola, 87 feet long. The over-all length of the blimp will be 324 feet and its capacity 825,000 cubic feet of helium. It will be covered with rayon, coated with synthetic rubber.

The Goodyear Corporation is also planning a commercial airship 950 feet long, with six 1,050 horsepower engines. It will have an operational range of 7,000 miles (maximum 11,000 miles) at cruising and maximum speeds of 75 and 90 mph respectively. Later, gas turbine engines will be experimented with. It will have interchangeable passenger and cargo units. It will carry 112 passengers "de luxe," with 63 square feet of space each, including individual cabins and all amenities, or 230 passengers with 25 square feet apiece. For short trips, it could accommodate 300 passengers, still with more comfort than in an airplane. Fares will be about three cents a mile. The crew would number 60, including stewards.

Alternatively, it will carry 180,000 pounds (90 tons) of freight over 7,000 miles. Compare this to the modern aircraft's payload of perhaps 8,000 pounds over 3,000 miles.

So that the airship will not have to moor at intermediate pick-up points, it is to carry a 14-passenger airplane as "picket-boat." Successful experiments in operating airplanes from airships were made before the war.

The cost of such a craft would depend on the number built. If six were ordered, the cost is estimated at about 8 million dollars each. Production of the first would take about 2 years, the remainder following at 6-month intervals. The Goodyear company has considerable backing in this venture and hopes to begin construction when its factories have completed present commitments.

The only other country apparently interested in airships is the USSR, where it has been reported that construction is under way, possibly on polar blimps. The Russians became interested in dirigibles in 1937, when they investigated all information available in America and Germany. They even wanted to purchase the wreckage of the *Hindenburg*.

It seems possible that we may again see the long, silvery shapes of airships in the skies—a method of transport, to quote Lord Ventry, British lighter-than-air advocate, "unbeatable for comfortable, safe, and economical long-distance flying."

Our skies have become highways that can be traveled either in peace or war.

General Carl Spaatz

Training Problems in Sweden

Translated and digested by the MILITARY REVIEW from an article in "Ny Militär Tidskrift" (Sweden) No. 6-7, 1948.

RECENTLY, the problem of training periods has been much in the foreground, with the Swedish *Riksdag* voting to reduce the period of training for the Army to 9 months. There are many grounds for critical comment relative to the handling of this matter. Previous pronouncements have, surprisingly, been shoved aside and practical requirements obviously disregarded.

World War II brought greater interest in the matter of defense and made those in positions of authority more keenly aware of the importance of thorough military training. In the communication of 13 June 1945, which constituted the basis for the defense committee's efforts, the *Riksdag* contended that good training was necessary if the Defense Services were to be able to fulfill their missions. It was said that the length of the training period certainly ought to be decided on this basis, with special emphasis on the requirements which modern warfare places on the men in the ranks.

We are now disregarding these basic principles. Even in the present critical situation, the *Riksdag* majority and like-minded individuals in the press turn a deaf ear to the practical reasoning of the military and listen sympathetically to the counsel of those who advocate reduction. The action of the defense minister is not consistent. His declarations concerning the importance of good training do not agree with the reduction program he advocated in the 1948 session of the *Riksdag*. His recognition of the necessity for training matériel for the standardization of training is not followed up by any real, energetic measures calculated to take care of this need. The assertion that the length of the training period may be shortened and, at the same time, the abilities of the men in the ranks increased, implies the launching of new and original training principles whose methods and results we anxiously await. As the main reason for the reduction, the defense minister alleged lack of civilian sympathy with an 11-month training period. The defense minister thus employs a purely yielding policy. He proceeds in an entirely different manner than his predecessor, who was a man with a mind of his own, even when his views differed from those generally held.

It is a striking fact that those persons who defend the 9-month policy make use of general expressions only, being unable to offer any convincing arguments. The training experiments being conducted by the military authorities are either disregarded entirely or given no weight. Even before these tests have been concluded, a readiness to reduce the length of the training period is displayed. The advocates of this reduction policy have made no serious efforts to learn what is accomplished in the 9-month period, disregarding the fact that the problem of providing cadres and training facilities has not yet been solved. No real investigation has been made by them of the training problem. At the same time, they rationalize to the extent of believing that they will obtain quality of training in some magical manner. They talk about an elite army without creating the prerequisites for one. They are conscious of the fact that the new art of war makes increased demands on the soldier, but they do nothing to solve the resulting problems. When confronted with the question of how one is to be able to train an efficient soldier in 9 months, they merely answer: "I dare say they will succeed!"

What will be the consequences of the

Riksdag's vote? It will automatically limit the Swedish soldier's capabilities and reduce troop capacity for maneuver. In comparison with an adversary, the soldier will be inferior and will realize that fact. The situation prevalent during the autumn of 1939 will be repeated. This is a disquieting prospect for all those who had personal experience with the situation at that time. Personnel losses will be great and the strategic plan for a long, delaying defense will be imperilled. The adverse effects will be multiplied by the fact that the group commanders' training period will also be reduced to 9 months, which, as has been declared by responsible military authorities, must lead to superficiality and self-delusion. Harsh words such as these must be directed to those who base their arguments on training premises which are false.

When civilian education is involved (e.g., primary school education), an effort is conscientiously made here in Sweden to increase the pupil's knowledge and to adjust the length of the attendance period accordingly. Thus, 9 years is the normal period for the elementary schools. This is well and good, but, unfortunately, we find an entirely different view prevails on military education, disregarding the importance of its role in our social existence. Why is this? How can it be that the lessons of the war years have so quickly vanished? In reality, the will to defend our nation should have remained strong, and those who now have apparently lost this determination should be ashamed of their achievement.

These matters of domestic policy completely obscure the fact that the *Riksdag's* decision on the length of the training period also has a side connected with foreign policy, and an important one. In the present tense situation as regards foreign policy, the great powers give much attention to the measures with which we are here concerned. It is increasingly obvious that present-day policies of the great powers are influenced by military considerations to a greater extent than in the past. Both in Moscow and in Washington, foreign policies are shaped, to a very large degree, in accordance with military points of view. Every sign of military weakness in a country is carefully registered and conclusions drawn. Moreover, remarkable progress has been made of late in the technical developments connected with long-range aerial weapons, which has led to Scandinavia having become still more appetizing to the great powers than it was 6 months ago. A shortening of our training period reduces our international prestige and limits our freedom of action in matters pertaining to foreign policy. Both those who advocate a policy of neutrality and those who recommend a policy of alliance are standing on more uncertain ground than before. They have, of their own accord, weakened the instrument which, by its nature, gives both force and latitude to foreign policy.

When the present question was brought up, a proposal for a compromise was presented, calling for a training period of 10 months. It is regrettable that this compromise was not accepted. For the majority of the men, 1 extra month of training would have been of value. This proposal also indicated a way of showing that the matter could be dealt with without making it a party issue, and of demonstrating, both to observers at home and abroad, that we still possess the will to defend our nation and still live under the banner of solidarity. The *Riksdag* has declared that this is but a provisional measure. We may hope that after the elections reason will be restored to its place of honor. In the matter of defense, the military mainspring does not run down as quickly as the political. On the military side, we hope and labor to the end that we may be able to train good soldiers in accordance with good, sound principles.

Air Power in a Land Offensive

Digested by the MILITARY REVIEW from an article by Air Chief Marshal Sir John Slessor in the "Journal of the Royal United Service Institution" (Great Britain) May 1948.

IN THESE days when dispatches by Army commanders are constantly being published, it may perhaps be of some interest to have a look at a contemporary view by an Air Force commander who was closely associated with one of our land campaigns.

Soon after the capture of Rome in the first week of June 1944, the United States Chief of Staff and the Commanding General, US Army Air Forces, visited Allied Force Headquarters in Italy to discuss future operations in the Mediterranean, including the invasion of southern France. Before leaving for America, General Arnold, Commanding General, US Army Air Forces, asked me for my views on the extent to which air power had contributed to the success of the operations leading up to the capture of Rome. I gave him the following notes which were dated Caserta, 18 June 1944.

Operations Against Rome

It may clear the issue to mention first the things that air power can *not* be expected to do in a land campaign of this nature:

1. It cannot by itself defeat a highly organized and disciplined army, even when that army is virtually without air support of its own. The German will fight defensively without air support or cover. He does not become demoralized by constant air attack against his communications and back areas. The heaviest and most concentrated air bombardment of organized defensive positions cannot be relied upon to obliterate resistance and enable our land forces to advance without loss.

2. It cannot by itself enforce a withdrawal by drying up the flow of essential supplies. The German has an efficient supply organization. His policy of living on the country regardless of the interests of the inhabitants, and his extreme frugality and hardiness, result in an unsurpassed capacity to maintain his supplies in apparently impossible circumstances.

3. It cannot *entirely prevent* the movement of strategic reserves to the battle front, or tactical reserves from one part of the front to another, or of forward troops to fresh positions in the rear.

4. In short, it cannot absolutely isolate the battlefield from enemy supply or reinforcement.

5. It cannot absolutely guarantee the immunity of our forward formations, back areas, port installations, base depots, airfields, or convoys at sea against occasional air attack or reconnaissance.

Capabilities

What air power *can* do and did in the Italian campaign, is to make it impossible for a highly organized and disciplined army to offer prolonged resistance to a determined offensive on the ground, even in country almost ideally suited for defense. It can turn an orderly retreat into a rout and virtually eliminate an entire army as an effective fighting force.

The converse of 1., above, is equally true. An army by itself cannot, in modern warfare, defeat a highly organized and disciplined army on the defensive. The power of the defense on land has not been overcome by the tank or by improved artillery technique, but by air power. It is doubtful whether anyone could be found to deny that, if there had been no air force on either side, the German Army could have made the invasion of Italy impossible except at a cost in national effort and human life which the

Allies would have been unwilling or unable to face.

The first thing the Air Force can do, to a degree which no one would have believed possible in 1942, is to so dominate the air in the battle area and in the enemy's rear that our Army can make its dispositions, supply, and administrative arrangements virtually without regard to enemy air threat.

It is hardly an exaggeration to say that the Allies in Italy virtually disregarded the existence of an enemy air force. There were occasions, such as in the Anzio beachhead, when the *Luftwaffe* was a nuisance, when inconvenience was caused by the sinking of an occasional ship with important cargo, or when a few casualties resulted from a sneak raid. But, taken by and large, the *Luftwaffe* ceased to exist as a factor of any importance in the land battle in Italy. The enemy was even denied effective reconnaissance, while on no occasion was any Allied Commander ever required to go short of information required from visual or photographic reconnaissance. An invaluable influence on the land operations was exercised also by artillery observation aircraft, which were able to operate virtually unhampered.

Communications

Largely owing to this domination of the air, the air forces were able to disrupt the German lines of communications to such an extent that the continued maintenance of upwards of 18 divisions south of Rome was little short of a miracle. With the exception of only one or two very short periods, during which one relatively unimportant stretch of line was open, every railway south of the line Pisa-Rimini was kept cut in several places after 24 March 1944. Immense dislocation was caused also by a series of very successful attacks by heavy bombers on focal points on the railway system north of the Apennines. For over 3 months before the assault on 12 May, enemy motor trucks were being destroyed at the rate of 20 to 30 a day, representing a monthly loss of about 50 percent of the trucks available in Italy. In addition, many other trucks were damaged. Although the enemy was able to supplement his road and rail transport to a meager extent by seaborne supply to the small ports on both coasts, movement of his shipping by day was brought to a standstill. He was never able to approach the program in terms of weekly tonnage which he needed.

Nevertheless, the aim we set ourselves at the end of February 1944, of making it impossible for the enemy to maintain his armies south of Rome, was not fulfilled before the opening of Operation *Diadem*. At the beginning of March, the Germans had substantial reserves in their depots and forward dumps, which were accumulated during bad winter weather when flying was impossible for our planes. In spite of the devastation of German communications and transportation, the enemy was able, by superb organization and unremitting labor, to maintain a daily tonnage adequate to maintain his forward stocks well above the danger level. He did this *so long as he was not being forced to fight*. It must be remembered that, except for the short and abortive battle of Cassino in March, the Italian front was inactive from the close of the enemy's last attempt to drive in the beachhead late in February until the opening of Operation *Diadem* on 12 May. In these circumstances, it proved impossible for the air forces to do more than hold the position on the German's supply front and to pave the way for the joint offensive in May.

Breakthrough

It should not be forgotten in the flush of victory that the real breakthrough did not come till 1 June—20 days after the

opening of the offensive. It is a fact that by the end of May General Alexander thought it probable that it would be necessary to call a halt, rest his tired divisions, regroup and build up for a further staged attack on the Unction line. But by this time, the enemy's reserves of fuel and ammunition were well below the danger point. The enemy's capacity to distribute stocks from the depots to units in sufficient quantities to meet the requirements of intensive fighting had been paralyzed by his enormous losses in vehicles and by the catastrophic condition of his roads. This, combined with fatal delays imposed by air action on the movement of reserves and with the reduction in the fighting efficiency of these reserves, broke the German resistance.

It is not suggested that the break was due to the Air Force alone. The Army played the essential part by breaking *in*, by maintaining pressure, by forcing the enemy to fight and to expend his energy, and by exploiting enemy weakness. But there is not the slightest doubt that the break-through would have been impossible but for the Air Force. We now have ample evidence to prove that two valid contributory factors were shortage of fuel and of ammunition.

Delaying Reserves

It has been said above that air power cannot prevent the movement of reserves. *Diadem* has proved, however, that it can delay and disorganize such movement to an extent that will be fatal in circumstances when it is essential to move reserves quickly to a threatened point, and to have them in a position to fight effectively on arrival at that point. We have ample and irrefutable evidence of delays imposed on the movement of strategic reserves by air action. Probably the most critical of these was the move of the *Hermann Goering Division*, which was brought in from the Leghorn area where it had been resting and refitting. One of the most remarkable incidents of the whole battle was the way in which that division, brought in to fill the vital gap about Valmontone, failed to have any important influence on the battle. We now know that its arrival was delayed, it suffered heavy losses in men and vehicles from air action on the way, and its morale was at a low ebb by the time it found itself in all the confusion of a fluid battle.

Confusion

Lord Trenchard has said that all land battles are confusion, and the job of the Air Force is to accentuate that confusion in the enemy's army to a point where it gets beyond the capacity of anyone to control. This is exactly what the Air Force did to the German Army in Italy in the critical last days of May and first days of June. Roads were cratered and blocked by destroyed vehicles. Communications were cut, villages became a mass of rubble barring through movement, and local reserves could not be moved because there was no gasoline. Forward troops were out of ammunition and out of touch with their controlling headquarters, nobody knew for certain where anyone else was, and the troops were hungry, thirsty, tired, and demoralized by constant attack from the air.

Above all, perhaps, the enemy was deprived, by the impossibility of rapid and coherent movement, of that tactical flexibility which has always been such an admirable quality in German defensive fighting. The surprising thing is, in the circumstances, that the remains of the shattered divisions were able to disengage at all or to preserve any sort of entity as units. It speaks volumes for the discipline and fighting qualities of the German soldier that they were able to do so to even a limited extent.

In fact, the divisions that were engaged in the battle south of Rome ceased to exist as first-line divisions. The enemy was able to extricate only a fraction of his tanks and heavier artillery. His disastrous losses in motor vehicles, amounting to hundreds a day during the crisis of the battle, were such that we know only the most vital supplies—fuel and ammunition—were allowed to be transported. The enemy was unable to evacuate more than a small proportion of his supplies and heavy equipment. Even if his vehicles had not been decimated and his road communications dislocated to the extent that they were, no army can advance or withdraw without the extensive use of railroads for the mass of heavy equipment. No appreciable rail movement from the front back to the Pisa-Florence-Rimini area had taken place for weeks. The moral is that we should continue to exploit the peculiar qualities of the air as the weapon of pursuit, to give the enemy no respite or opportunity to build up stocks of ammunition, fuel, and equipment, and thus maintain the impetus of advance.

Russian and German Tactics in World War II

Translated and digested by the MILITARY REVIEW from an article by a former German battalion commander in "Allgemeine Schweizerische Militär Zeitschrift" (Switzerland) November 1948.

WITH every new war, technique takes another step forward. In order to adapt to this development, methods of attack have had to change.

In World War I, the steady improvement in firearms completely changed the battle order. Open skirmishers' lines took the place of the solid ranks, with more distance between men. In the years following that war, training was organized on the basis of the new knowledge that had been acquired. These were the methods used at the beginning of World War II. In the following paragraphs, it will be shown how combat methods also changed during World War II.

In July 1941, my battalion was advancing in a compact formation for its first attack on a Russian field position. The companies were deployed in a skirmishers' line. As far as the eye could see, the echeloned companies were advancing as if they were on a parade ground. Two tanks were supporting the attack of each company. The impression produced by this picture was overwhelming. The Russians were terrified and surrendered without offering any real resistance. Shock alone compelled them to give up.

A few weeks later, I had to defend a village with a company, acting as a combat outpost ahead of the main line of resistance. I sat in the gable of a house and watched the Russians attack. The attacking regiment, in deployed formation with tank support, came nearer and nearer. The slowly, quietly, and constantly advancing menace aroused a feeling in me like that of a noose being drawn tighter and tighter around my throat. My men had the same feeling. No one thought of shooting because of fear and terror. Panic went so far that an officer of the infantry gun company blew up his guns without making an effort to bring them back. All the troops began running back to the main line of resistance in wild groups. Time and again, it became necessary to force machine-gun crews at the point of a pistol to go back and open fire on the advancing Russians. Here again, as weeks before, the combat formation of the attacker produced an impression on the defender so powerful that no

one thought of firing because of utter, paralyzing fear.

Within a short time, both sides became accustomed to combat. Nerves no longer gave way, and machine guns and rifles were coolly trained on the attacking lines. Even single machine-gun nests often held up forces a hundred times stronger. The hard defensive battles fought by both sides and the mass losses they suffered showed clearly that attacks conducted with troops advancing in a skirmishers' line resulted only in losses. Therefore, a new combat formation was developed. The tactics of the empty battlefield came into use. The Germans no longer had troops to sacrifice by using the old method of combat.

It cannot be determined accurately which side used this method first. The only thing that is certain is that both sides accepted the necessity of changing from action on an open battlefield to a form of quiet, stealthy fighting. An example of this new form of combat is the combat patrol, camouflaged with the foliage of bushes, which slips quietly into an enemy position and just as silently brings back a captured sentry.

In order to develop these tactics, courses were given to individual officers in the German Army from 1942 on. The combat regulations for the Soviet Army for the same period also show that they adopted similar principles. Attacks which were conducted along the lines of the old, time-tested combat tactics during the first year of the war had now become wholly outmoded and impractical. This was a result of the lack of manpower and of the increase in defensive firepower. The units employed were small and great distances were maintained between them. The small units filtered inconspicuously into a previously determined sector of the terrain. The closer the enemy, the smaller the detachments. From about medium distance (900 yards) up to points very close to the enemy, movements were carried out with no more than two men operating together at the same time. They were instructed to crawl or drag themselves over the ground. Separate groups were permitted to start forward with large time intervals between them. Then they were to "trickle forward" until very close to the enemy. This method of working up close to an enemy position was particularly difficult, due to the natural herd instinct of the soldier. That is, every soldier generally seeks to remain a part of a large group because he feels himself more protected and safer there. As a result, a special officer *(Ablaufoffizier)* was employed to watch the groups of men closely as they were sent forward to ensure that they did not close up on preceding groups. This officer was responsible for seeing that the proper distances between groups were maintained. Advancing in this manner, a unit frequently required several hours to move up to where it could penetrate an enemy position. Yet, in all such actions, time was never the principal concern. The idea was to launch an attack with as little fire preparation as possible. The lack of ammunition and heavy weapons made this necessary. Surprise in penetrating an enemy position was of primary concern. This method of attack was employed time after time with complete success. As far as weapons were concerned, it goes without saying that only light infantry weapons, such as semi-automatic rifles and light machine guns, could be taken along. The enemy can hardly be approached stealthily if the attacker is carrying a mortar or a heavy machine gun. The fact that heavy weapons were becoming increasingly scarce, due to breakdowns, was also one of the important reasons why we were forced to use ways and means other than fire for closing with the enemy.

The fact must be emphasized that in this Indian-type warfare the Russians

were far superior to the Germans. They were truly masters in devising means of camouflage. For example, on one occasion, there was a small forest a considerable distance ahead of our position. During the day, the woods seemed to be closing in on us, but we believed that our eyes were deceiving us and paid no attention to the matter. After a few days, this woods suddenly erupted with fire which engulfed our position. An entire Russian artillery battalion had been concealed behind this movable woods and had worked its way up to within close range. This example of the art of camouflage on a large scale gives an idea of the mastery achieved by the Russians in the camouflage of men, equipment, and movements.

The most unbelievable things were done. For example, an artificial grave with a little embrasure in front cost many German lives until it was finally discovered where the shots were originating.

Large stones were shoved forward, inch by inch, to conceal the soldiers behind them. Bushes and shocks of grain were used in the same way. In this type of fighting, a Russian soldier was seldom seen on the field of battle.

The relatively large combat formations employed at the beginning of the war nearly annihilated the soldier, but the fighting against a furtive enemy in the latter phases of the war practically incapacitated him for effective action. On top of all this, distressed minds saw an attacker behind every bush and stone, even when none was there. Firing never ceased, day or night. This wore on the nerves. Later, when enemy forces did finally slip up, they succeeded in penetrating the German lines time and again.

These examples show that continuous improvements in firearms during World War II forced the development of a warfare of stealth in the place of combat in the open field.

An estimate of timing in the progress of the battle is an essential feature of any military plan, since this plan must coordinate all the resources available to the commanders. On the other hand, enemy reaction often upsets the rate of progress, and it is quite impossible to stick to a rigid timetable.

Major General Christopher Vokes, Canada

The enormous increase in fire power resulting from the employment of new weapons such as atomic bombs, reaction-propelled projectiles, etc., shows that in the future, dispersion will be forced upon us as an inexorable law, not only on the field of battle but throughout all territory susceptible to bombardment.

General de Lattre, France

The Germans and Air Superiority

Translated and digested by the MILITARY REVIEW from an article by Colonel Paquier in "Forces Aeriennes Françaises" (France) July 1948.

THE history of the *Luftwaffe* is, in a way, the history of one man. Goering, the future German air marshal, an "aviator-politician," was aroused against those in favor of traditional concepts and enthusiastic toward Douhet's theories. But the German general learned from the Italian general only the idea of the supremacy of bombing forces over fighter units.

Goering succeeded, almost from the beginning, in imposing his views on the Germans. In 1935, he was instrumental in the creation of an independent Air Ministry, while the army and the navy remained grouped under the War Ministry. Quite obviously, in case of a conflict, the German air forces would engage in operations independently of the ground forces. But dissension soon broke out between Goering and the Chiefs of the *Oberkommando der Wehrmacht* (OKW), who fought with the *Reichsmarshall* for first place and affirmed: "Germany finished World War I with 39 attacking squadrons *(Infanterie-Staffeln)*; our nation must maintain the principle of an air force employed in the support of the ground troops."

The OKW generals expressed themselves with a unity of view which can be explained only on the grounds of conservatism and erroneous concepts dating back to 1914-1918. The argument of the ground soldiers was still the same: "The first battle must be won." At this time, Hitler settled the argument by siding with the OKW. Who in Germany would dare, after that, to contest the authoritative force of these arguments?

Establishing Basic Doctrine

Then came the war in Spain, in which the only German fighter tried out was the *Heinkel 51*. This plane proved too slow in comparison with Russian fighters and it was transformed into a fighter-bomber. The *Junker 87s* then entered the battle. Both *Heinkels* and *Junkers* attacked the troops on the ground with definite success. From then on, the approval of the German High Command was decisive: aviation was an accompanying weapon of the ground forces. It was necessary to support the ground forces from the very beginning of the battle, instead of carrying on an air battle first.

On the ground, the doctrine of *blitz* warfare gained impetus. The lessons of the Spanish war seemed in themselves sufficiently clear. Surprise being the basis of *Blitzkrieg*, it was useless, concluded the German manuals, to combat the enemy air force. It would suffice to neutralize it at its airdromes. With forces being concentrated to the maximum extent, the *Luftwaffe* would give bombing support to the mechanized forces in their rapid advance. *Reichsmarshall* Goering again got his bombers.

On 1 September 1939 "air power" was in the hands of the aggressor. Germany was in fact qualified to ensure the delivery of freight and passengers or destructive weapons and fighters by air at a given point and to satisfy definite ends. Two thousand *Luftwaffe* planes, by destroying the Polish air force at its airdromes, had air superiority from the start. Unity of action, speed, and surprise was combined to give victory to the *Luftwaffe*. On 1 September 1939, the *Luftwaffe* lost only 10 planes. Hence, on the second day of the battle, the entire German air force engaged in support of the ground troops.

On 24 November 1939, in a conference at Berlin before an audience of foreign military attaches, a spokesman for the *Luftwaffe* declared: "During the 25 days

of combat in Poland, almost all of the flights and the greater part of the ammunition consumed by the air force served to support the ground army."

This support of the *Wehrmacht* was amazingly successful. The lecturer concluded: "The Polish campaign did not confirm Douhet's theory in regard to independently conducted aerial warfare." In the eyes of the German commentator, conclusions were clear. However, he forgot just one detail: the Polish air force possessed only 580 planes.

Yet some German aviators—like Galland—based their views on the war in Spain. They declared that profitable lessons could not be drawn from so short a battle as that in Poland, where the disparity of forces was so extreme. But the voices of such critics were lost in the general sense of well-being which prevailed. The Germans were strong in an experience which they regarded as decisive, and possessed numerical superiority, even though they were technically inferior when compared with the western air forces.

So single-minded that they seemed to have only one mind and one voice, the German military leaders applied against France the tactics which gave them such success in Poland. Surprise, speed, and concentration of forces made the campaign a 45-day battle. But we see here the first mistake: the *Luftwaffe*, faithful to its doctrine, did not first fight the battle for air supremacy. The bombing of the airfields did not destroy the French fighters. The penalty was swift: from 10 May to 25 June, the German air force lost 1,000 planes.

Thus, in spite of the numerical weakness of the Allied air forces, which used their fighters mainly to protect ground objectives and air transportation, Germany suffered considerable losses. This error was to weigh very heavily on the development of the battle for Britain.

Battle for Britain

One month after the end of the hostilities in France, Hitler attacked Great Britain. Along with all his people, he expected a short war. True, the attempt was not without difficulties. But everything tended to confirm the Germans in their hopes. Did England have a ground army? Yes, but insignificant. As for her navy, it was occupied in all the oceans where the Allied convoys felt themselves menaced by submarines. Against the *Luftwaffe*, the light British defense aviation constituted only a nominal air force; it possessed only 300 fighters. Opposing the English armed forces, the *Wehrmacht* possessed a ground army which was numerically powerful and flushed with victory. Above all, it had an air force of 1,500 bombers and 1,000 fighters. Hitler insisted with rare foresight on one major factor—that the invasion could take place only if Germany possessed air superiority.

There were two ways to obtain this air superiority: destruction of the British fighter force in aerial combat, or defeat of the Royal Air Force at its airdromes.

The German military chiefs could not count on an immediate combination of ground and air action. Therefore, they decided to attack the British fighters in the air at once. Initially, the maneuver succeeded, but soon, in view of the losses that it suffered, the RAF ceased to take to the air *a priori*. The *Luftwaffe* modified its tactics and sent out "trap formations." Very quickly, this method backfired and the German air force suffered serious reverses.

The inefficiency of the German fighters reestablished Goering's preference for bombers. It then occurred to the *Reichsmarshall* to resort to the second method of destruction: attack the RAF at its airdromes. Applying the principle of concentration of force, the Germans sent formations of 80 bombers, accompanied by

The Germans developed a number of good performance planes, but they failed to employ them to the best advantage or were too late in getting them into effective use. The *Messerschmitt 262A-1*, above, a jet-propelled fighter with a speed of about 515 miles per hour, was once considered "the best fighter in the world." It was tested in 1943, but Hitler delayed its production for 6 months and later insisted on its being used as a bomber. It was in use for only a short time in 1945. Right, a *Messerschmitt 109*, which was used to attack Allied bombers. Below, a *Messerschmitt 410*.—US Air Force photos.

200 or 250 fighters, on these missions. The method nearly succeeded.

There were two reasons for the *Luftwaffe* failure:

1. Accustomed to a combined battle, where the action of ground and aerial mass, together with surprise, governed the outcome of the operations, the German air force disregarded the principle of flexibility of *employment*. The paralyzing protection which the fighters were forced to give unceasingly to the *Luftwaffe* bombers is proof of this.

2. Considering the bombing attacks as efficient, Goering neglected to continue the pursuit of his objective. The attacks against the airfields of Great Britain lasted scarcely more than 2 weeks.

Everyone is aware of the disordered reactions which followed this failure: the mass bombings of London, the transformation of fighters into fighter-bombers, and the night attacks. These decisions actually were admissions of defeat. To summarize the tactical characteristics of the battle for Britain, we could say that the Germans were defeated by the forces which were to win victory for them. The dogma of concentration of force—not joined with economy of force and flexibility of employment—led them to defeat. The English saved their island because they understood the interdependence of these principles.

The defeat in the English sky taught the OKW nothing. The Balkan campaign restored the principle of support aviation to its place of honor. And when the *Luftwaffe* attacked Russia on 22 June 1941, it seemed as if the battles of Poland, France, Yugoslavia, and Greece were being fought again. "Our surprise victory over the Russian air force is incontestable," declared Lieutenant General H. J. Rieckhoff in a brilliant but superficial improvisation. After a week of fighting, the Russians acknowledged 850 planes lost; the Germans claimed 4,000 victories. The German High Command did not enjoy any lasting advantage from this evident air superiority. Apart from the bombings of Moscow, the object of which was, at first, psychological, the General Staff of the *Luftwaffe* did not conduct any strategic air battles. At the height of its power, the German Air Force showed itself unable to prevent the supplying of the USSR through Murmansk, the only external port which Russia possessed. After 1942, in the face of the stiffening Soviet defense, the air force operated more and more in tactical support, at the request of the ground command. The *Luftwaffe* was then forced to "disperse the formations in groups of two or three planes over a front of several hundred kilometers, in order to please everybody" (Lieutenant General Rieckhoff). Incapable of imagining anything else except a *Blitzkrieg*, the German chiefs, opposed to all daring gambles or speculations, showed themselves unable to conduct a sustained air war. The result of that shortcoming was that the Russian air force had five planes for every one possessed by the Germans by the end of 1942.

The battle for Malta was a repetition of the errors of Goering in Great Britain. Fighters were paralyzed by having to give protection to bombers; bombing was conceived without relation to the battle for air superiority; economy of force was relegated to second place. Nothing had changed in 2 years. Two fighter squadrons failed to annihilate the few British fighters which took off from aircraft carriers. And Malta was lost for Germany.

Allied Air Attacks Begin

At the moment when the *Reich* was swallowing this new defeat, the Allied air forces began their bomber raids over Western Europe. Since the end of 1942, it had seemed evident to the Nazi leaders that the German fighters should be reinforced for defense against Allied raids.

Galland, inspector of the fighter force, requested Hitler to increase the number of the fighter units in such a proportion that three German planes could fight against one Allied plane. Germany's aeronautical industry made a vigorous effort and succeeded in constructing 1,050 fighters per month in 1943. Up to the time of the introduction of the American *Mustangs* and *Thunderbolts*, the *Luftwaffe* fighters achieved marked successes. But after the appearance of the Allied escort fighters, the *Luftwaffe* found itself in a state of inferiority—qualitative at first, and quantitative later. Galland attempted to overcome these shortages, and particularly the scarcity of air personnel, which came about through changing the methods of employing the fighters. He divided the German fighters into two groups: a heavy group for attacking bombers, and a light group for attacking fighters. It was specified that each group was to act independently of each other. In spite of the flexibility of this method, the Germans utilized the light groups to protect the heavy groups, a renewal of the errors of the battle for England.

From this time on, the mistakes piled up. At the end of 1943, Galland, one of the rare superior officers of the *Luftwaffe* whose ideas remained clear, made the first tests of the jet fighter *Messerschmitt 262*. The technical progress revealed by the new plane was so far superior to the Allied matériel that Galland asked for the immediate mass production of the new plane. Thus, the jet plane units were to be Germany's pillars of aerial defense. With the technical superiority of the *Me 262* over the Anglo-American fighters, its use in action would permit the *Luftwaffe to* halt the Allied air offensive. Galland insisted that the fighter force was the arm, above all, of air combat, and that it must continue the destruction of Allied aviation. As for missions of protection and direct cover, they must yield to the systematic attack of the enemy's air forces. Galland's plan was submitted to the *Führer*. Without hesitation, Hitler retarded the manufacture of the new jet plane by 6 months!

In the meantime, the German fighter force, whether employed by day or by night, attempted to hold its own against the Allies. Warding off the most pressing attackers, the *Messerschmitt 109s* and the *Focke-Wulf 190s* attacked the Allied bombers, ignoring the fighter escorts. The *Mustangs* and *Thunderbolts* then were at full liberty to attack. The *Luftwaffe* losses which resulted were heavy. In the face of the rapid disappearance of the German air force, Goering and Speer, Minister of Armament, decided to take energetic measures which resulted in the creation of the *Jagerstab* or Fighter Force Command. Galland was the soul of the new organism, which was characterized by its flexibility and simplicity. The *Jagerstab* submitted to Goering a plan which provided for the monthly production of 5,700 planes. The *Reichsmarshall* approved the project on the condition that the construction of bombers not be reduced. Hitler, in turn, learned of the plan, but unqualifiedly demanded that the *Me 262*—the best fighter in the world at that time—be equipped as a fast bomber.

Following the terrible destruction suffered by the aeronautical industry from the Anglo-American attacks of February 1944, Galland gained the point that the defense of German territory was to be considered as the primary mission of fighters. But after the invasion of Normandy, the ground situation evolved in such a manner that Hitler, on his own initiative, decided to transfer all fighters to the front. The German sky was then open to the Allied efforts. The English and the Americans seized the opportunity, and in the absence of any German counteraction, generalized the employment of fighter-

bombers. We know what that cost the German railroads.

An unusual event was to bring the Germans to a realization of the truth. In October 1944, an American flier, in the course of his interrogation after being shot down, emphasized the crushing superiority that the *Me 262*, equipped as a fighter, would give the Germans. It was a revelation for all the politicians of Germany. The decision was finally made that the *Me 262* was to be a fighter. After many technical and political adjustments, after controversies in which personal interest had its share, the *Me 262s* appeared over southern Germany in April 1945. They achieved some success, but the capitulation of Germany came a month later.

Conclusions

One fact stands out. The Germans did not carry out an aerial battle. To an exaggerated degree, confident of the value of their ground forces, the political and military chiefs of the *Reich* forged a *Luftwaffe* whose missions were narrowly limited for a short continental war. Furthermore, Allied morale was underestimated. Conduct of the *Blitzkrieg*, requiring an absolute concentration of all forces, necessarily reduced the German Air Force to a secondary role, entirely shaped by the needs of a ground army. Defeated in the face of fighting conditions absolutely foreign to their traditional conceptions, torn by political strifes or by quarrels involving personal prestige, the majority of the generals of the *Luftwaffe* were not able to adapt their doctrine to the imperative demands of war.

Deprived of her crushing numerical superiority by 1943, Germany lost her air power, the orthodox definition of which is: "The ability of a nation to sustain its indispensable aeronautical expansion, new concepts, and latest techniques, during a critical period."

An Approach to Military History

Digested by the MILITARY REVIEW from an article by Major R. G. S. Bidwell in "The Army Quarterly" (Great Britain) January 1949.

NOT long ago, the writer of this article heard an RAF officer argue that the study of military history was worse than useless; it was dangerous. A study of out-of-date campaigns, he said, merely caused people to repeat old mistakes in a new form. As for "the principles of war," they were so many and so contradictory that anyone attempting to carry them all in his head at once was like a golfer trying to remember everything his "pro" had said at the last lesson. He would become confused, self-conscious, and be bound to dub his shot.

The point is: What is the aim of teaching military history? Field Marshal Wavell gives us a hint when he says the important thing in studying Napoleon is not the strategy by which he defeated the Austrians, but how he induced a ragged, mutionous, and unpaid army to cross into Italy and fight at all. Character, then, the character of generals, and the morale or collective character of the men, must be the first object of study. This, however, does not answer the question of why we study military history at all. Earl Wavell's lectures are concerned with generalship. But how many of the officers who unwillingly swallow doses of military history when they are subalterns will become generals? There is time enough for these high studies when they go to Staff

College or have the inclination to read for their own amusement or profit.

The aim of the first lessons in military history, it is suggested, should be to arouse interest. It does not matter, at this stage, whether the young officer absorbs the faintest notion of the principles of war. It is sufficient if his imagination is stirred so that he reads a book voluntarily on some campaign or on some general's life. Something really worth while has then been achieved. A good story and realistic characters are what are required for the beginner.

The writer is now going to have the temerity to propose four brand-new "principles of war" to serve as a framework for our initial study of war. The "Sacred Seven"—or is it eight?—may be all very well for generals, but these I propose are for company commanders. It is suggested, then, that the next step in military history should illustrate the following:

1. *The Principle of Morale.*

What makes men fight, or makes them run away? What is the effect of leadership, or discipline, or religion, or having a cause? How is it that Italians run like rabbits in some campaigns and yet under Garibaldi fought regular French troops like tigers? How or why did the men of the Crimea endure the appalling conditions of disease and starvation? What made the Eighth Army ready to turn and fight again after one of the worst beatings in British military history?

2. *The Principle of Training.*

Untrained troops are beaten. Trained troops win. How easy it is in peace to devote too much time to the lines of whitewashed bricks, or the decoration of office walls with graphs and diagrams, and too little to the technical business of killing the opposition. We have too often entered wars with untrained troops or troops trained for the wrong purpose.

3. *The Principle of Bandobast.*

We were going to write "Administration," but the Hindustani *bandobast* is admirably suited to low-level administration of all sorts. The Duke of Wellington's views on "line" and "column" are of little interest; but his views on the provision of camp kettles are still worth a lot. Where, and how, were the antiaircraft guns packed in the ships that went to Norway?

4. *The Principle of Muddle.*

However excellent the planning may be, all battles are a frightful muddle from the worm's-eye view. This is due to the enemy, the weather, the darkness, and fortune—but principally to the enemy. The colonel is killed, the radio mysteriously goes off the air, the tanks fail to arrive, there is an enemy patrol on the line of departure, and the company is lost. It is of great advantage to have prior knowledge of all this—in principle—and to refuse to be diverted by it.

History shows that:

1. The same thing is happening to the enemy.

2. Many a muddle has been righted and a battle won by junior officers doing the best they can with what they have at the time.

The study of these four "principles" could be made by referring to some of our really disastrous campaigns as well as the successful ones. The thought of Alamein and Waterloo is gratifying, but one cannot help feeling that the Crimea and Gazala will give us better lessons. The American War of Independence, the life of Miss Florence Nightingale, the early reverses of the Boer War, and the administrative arrangements in Mesopotamia in 1915-1916 should also be included in the syllabus.

Here is another suggestion. The close study of a complete campaign, as is done at the Staff College, may reward the student who has learned how to read for himself. For the beginner, however, it is suggested that the examples chosen should be narrative and short, so that the student never is drawn into trying to unravel

dull strategy or motives. The instructor should search widely for his examples, choosing the most modern and the most ancient, in pairs, to illustrate the same point. The more remote from the present some examples are, the better, as the technique of modern war often obscures the basic truths. If the instructor wants to illustrate the effect of a flank attack, let him choose, say, Cromwell's armored attack on Leslie's right at Dunbar. He could mention how the Lord Protector was seen pacing by the watchfires that night, so racked with anxiety that the blood from his bitten lip ran down his chin. He should describe how the sunlight struck St. Abbs Head, how the Highlanders broke, and how the Lord Protector rode forward, sword in hand, shouting with relief and exultation: "Let God arise! Let His enemies be scattered!"

Another example is that of the Texan at Gettysburg, who sadly said to a hare which had been startled from its nest by the advance of the line: "Run old ha'ar, and if I was an old ha'ar I'd run too!"

It is such little glimpses which make dry bones put on flesh. If an instructor fails to use them, he is a blockhead and should be limited for the future to teaching "Hygiene in the Field" or the "Sequence of Laying."

Such examples can be multiplied indefinitely. The reader can choose his own; not everyone's imagination is kindled by the same thing. But one can be sure that such things stick to the memory long after boring and irrelevant strengths and locations have faded. Military history must present war as it is, fog and all.

All this has not brought us any nearer to answering the charge which originally inspired this article: that the study of military history is useless. No such proposal would seriously be advanced, nor is any defense attempted here.

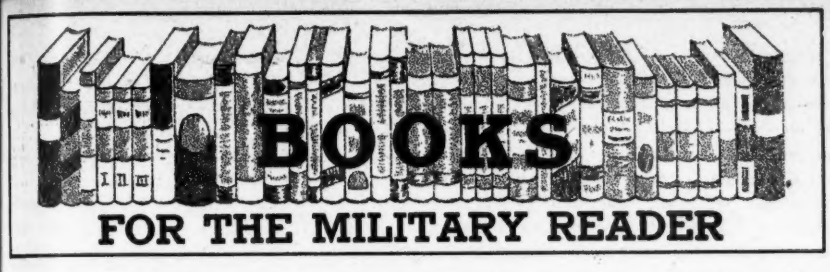
What is seriously advocated, however, is that the original approach to the subject must be through the imagination. It is probably right to say the majority of officers regard military history as dry and academic; something they can avoid unless they are detailed to lecture to their troops on the "history of the regiment" on a wet afternoon, or unless they are forced to cram for the Staff College entrance examination. Once their interest is aroused, they may even follow Napoleon's injunction "to read and reread the campaigns of the great captains." At least, they will avoid joining that class of fools described by Bismarck as those who learn only by experience.

Five thousand years of history show that the defenseless nation is the nation most subject to attack.

General George C. Kenney

War is the aftermath of the failure of diplomacy, but it is the continuation of policy and its object is to enforce that policy as economically as possible.

Sir Arthur Tedder, Great Britain



FOR THE MILITARY READER

ELEVEN GENERALS. Studies in American Command. By Fletcher Pratt. 355 Pages. William Sloane Associates, New York. $5.00.

Through this study of 11 American military leaders, the author gives a partial picture of the American military tradition. The commanders chosen for the volume are Nathanael Greene, Anthony Wayne, Jacob Brown, Richard M. Johnson, John Buford, Philip H. Sheridan, George H. Thomas, James H. Wilson, Charles P. Summerall, A. A. Vandegrift, and Omar Bradley. All 11 men were primarily combat commanders who stressed the offensive and relied largely on the fire power of attacking infantry.

THE WAR IN BURMA. By Roy McKelvie. 306 Pages. Methuen & Co., London. $3.50.

The Burma campaigns from 1942 to 1945 continue to be an interesting subject for the military reader. This interest has been due partly to the personalities involved, partly to the difference which arose between the British and Americans, and partly to the fact that the fighting there was little publicized at the time and therefore little known. The author of this work was a military observer under Admiral Mountbatten. As he puts it, McKelvie has followed a middle course in his account—somewhere between *Wrath in Burma*, by the American writer, Fred Eldridge, and *Campaign in Burma*, the official British account by Frank Owen. One chapter is devoted to Anglo-American relations.

STRATEGY IN WORLD WAR II. A Strategical Examination of Land Operations. Lt. Col. Alfred H. Burne. Military Service Publishing Co., Harrisburg, Pa. $2.00.

The advent of the atomic bomb has not necessarily changed the aspect of war, this author believes. The accepted principles of war are still important, but adherence to them is only one of the factors involved in modern conflict. Chance, enemy action, the weather, and many other factors exercise great influence on the conduct of battle, he points out. In all decisive victories, the destruction of an enemy army depends on having something solid behind it against which it can be crushed; this can be an outflanking element projected laterally or vertically, a geographical obstacle, or a rapid pursuit. The last half of the book deals with the application of the principles expounded earlier to the campaigns of World War II. The campaigns are presented in condensed form and accompanied by diagrams.

CHAMBER'S TECHNICAL DICTIONARY. Edited by E. F. Tweney and L. E. C. Hughes. The Macmillian Company, New York. $6.50.

Some 51,000 terms used in the language of science and technology are contained in this new edition of a well-known British work. More than a hundred branches of scientific and technological activity are included in the vocabularies. There are also many new terms connected with recent developments in atomic physics, radar, electronics, chemistry, and plastics.

SOVIET ARMS AND SOVIET POWER. The Secrets of Russia's Might. By General Augustin Guillaume, French Army. Infantry Journal Press, Washington, D. C. $3.50.

General Guillaume was French Military Attache at Moscow from 1946 to 1948, and his book reflects firsthand facts from that vantage point. First, the author analyses the attitude of the Russian leaders from 1939 to 1941, during the German victories on the European front. This is followed by an outline of the military operations on the Eastern front from 1941 to 1945. The main part of General Guillaume's volume deals with the factors of Soviet power and the Soviet armed forces. Here he discusses the elements that made up the power of the Soviet state, Russia's war economy, Allied aid, and Russian military preparations. Under the subject of the Soviet armed forces, he discusses the Russian high command, manpower, morale, strategy, and the use of the ground, air, and naval forces. Appendices give information on prominent Soviet marshals and admirals, military schools, and Army matériel. There is a foreward by Lieutenant General Walter B. Smith, former United States Ambassador to the Soviet Union.

THE TIGER OF FRANCE. By Wythe Williams. Duell, Sloan & Pearce, New York. $4.50.

New light on World War I is revealed in this biography of Georges Clemenceau, former prime minister of France. The author knew the French statesman intimately from 1913 until his death in 1929.

NEW WORLDS EMERGING. By Earl Parker Hanson. Duell, Sloan & Pearce, New York. $3.50.

Twenty-five years of exploration and research from the Arctic to the tropics form the background of this book which analyses the world's present geographical expansion and contests the theory that there are "no new frontiers."

THE SINEWS OF PEACE. By Winston S. Churchill; edited by Randolph Churchill. Houghton Mifflin Company, Boston. $3.00.

Twenty-nine postwar addresses by Great Britain's wartime Prime Minister form the text of this book. The speeches cover the period from October 1945 through December 1946 and include the "Iron Curtain" speech delivered at Fulton, Missouri.

THE MILITARY STAFF. By Lt. Col. J. D. Hittle, USMC. Military Service Publishing Co., Harrisburg, Pa. $3.00.

In the 1949 revised edition of this work on the military staffs of the world, the author has included a detailed study of the current Russian staff. The book traces the development of the staff from ancient times down to the present and includes much material on the United States, British, French, German, and Russian armies.

HANDBOOK FOR SPIES. By Alexander Foote. Doubleday & Company, Inc., New York. $3.00.

Alexander Foote is the pseudonym of an Englishman who was employed as a communist spy. His first assignment was to Spain in 1938, and after the civil war there he was sent to Switzerland. He tells the details of building a spy network and the methods of the ring for which he worked in Switzerland.

NEW COVER

With this issue, the cover design of the MILITARY REVIEW has been changed for the first time since August 1943. It suggests some of the new weapons and concepts of warfare developed from World War II, and is a joint effort of the staff of the magazine and the artists, Sgt. 1st Class John S. Denney and Mr. Charles A. Moore.